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A QUARTERLY MAGAZINE OF ORNITHOLOGY

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PREDATION OF GULLS IN MURRE COLONIES

BY R. A. JOHNSON

The destruction of large numbers of eggs of the Atlantic Murre (*Uria aalge*) by gulls has been reported by many observers and usually credited to the extreme stupidity of the murre. In eastern North America the Great Black-backed Gull (*Larus marinus*) is the species responsible for the damage and in western waters the Western Gull (*Larus occidentalis*) appears to be the culprit. Methods to check the gull as a predator have been proposed and in some cases introduced without knowledge of the inherent behavior patterns involved in the murre-gull relationship. This procedure may very possibly result in the acceleration of the damage which it is intended to check.

To better understand the relationship of these birds on the nesting ground let us consider some of their adaptations to food getting and to natural enemies and thus learn in what way their interests clash as neighbors in restricted areas during the nesting season. The gull is normally a scavenger in its feeding habits. It can not dive for food as can the murre, and is therefore subject to periods of starvation in a way that the murre is not. But the gull is at home in the air, escapes the approaching enemy easily and depends upon its own faculties to recognize safety. The gull is very useful to the murre to warn it of approaching enemies. The warning cry of the gull elicits an immediate response from the murre. As long as man stays out of sight of the nesting murres and the population of the gulls is within reasonable limits, the gull gets for the most part only a scavenger's share of the murre eggs—mostly the abandoned ones. But, if the murre's vigil becomes weakened by any influence, such as disturbance, the former scavenger has little trouble in securing many eggs. Quickly the gull becomes an aggressive predator and takes the first unguarded egg. The adjoining murre missing her accustomed neighbor becomes uneasy and falters at the wrong moment so the gull gets her egg too, and then another and another. Meanwhile the non-incubating group of murres is increasing—a condition which adds to the general restlessness in a way to accelerate the loss of eggs. If the disturbing factor

soon desists these unoccupied murres will likely soon produce another egg and incubation pertinacity may be re-established. On the other hand, I found while studying the Atlantic Murre in relationship to the Great Black-backed Gull, that if the colony is accessible to gulls and it is disturbed more than about three times by man during the early incubation period it is likely to be mostly or entirely lost. In cases where the murre colony is relatively small and exposed to gull attack (gulls will not go down into caves or deep crevices), and gull food is otherwise scarce, progressive loss of the murre colony may occur without being in the first place initiated by the disturbance of man. Some of the birds may join another breeding colony elsewhere and lay again.

The Fear Response in the Murre

The development of a fear complex in the murre of which I have spoken and which appears to become quickly contagious is at first ilicited through three or more serial responses, which may be observed when the breeding colony is first visited by man. The three responses to which I would call attention are as follows: (a) Response to gull warning cries by slight initiating movements—lifting of the head by those birds in exposed positions or by those to the least degree preoccupied by the incubation urge. (b) More intense raising and lowering of the head combined with vocal utterances from the incubating birds upon sight of the approaching enemy. (At this point all unoccupied birds move away from the locality of the breeding colony). (c) A flapping withdrawal of certain birds upon close approach of the enemy or after actual predation, and immediate stampeding of that part of the incubating colony composed of birds in position to see the flapping exit of their companions. Birds so located that they can not view the flapping exit of their companions will often remain and continue to incubate while the main body of the colony is being captured for banding purposes. Herein is evidence that the wing flapping of birds in a stampede is the actual stimulus which elicits the same response from their companions.[1]

This entire series of responses may be observed in a breeding colony of Atlantic Murres which has not previously been disturbed but as already stated, the birds so soon become conditioned that they readily all leave their eggs when they hear the gull warning. Furthermore they seem to lose any power to differentiate in their response to different meanings in gull vernacular. After this sequence of stimuli

[1]I believe that the white tipped secondaries in the murre have a function as releasers to the flight response. I have already shown that this character does not occur in plumage of young birds. (Auk, July, 1938).

FIG. 23. Colony of the Atlantic Murre near Fog Island, Quebec.

FIG. 24. Collected shells of Murre eggs showing the destruction by the Great Black-backed Gull.

and responses has been experienced two or three times the colony becomes so conditioned that it will respond to a nearby gull cry by stampeding in the middle of the night. Such a conditioned colony is subject to progressive loss of all eggs accessible to the gulls and if the entire colony is accessible the murres are likely to all abandon after a thirty to fifty per cent loss. The final loss may take place several days after the initiating disturbance which caused the fear conditioning has disappeared.

To understand the behavior of the murre in this fear response one should be aware of certain other characteristics of the bird. Some of these I shall list: (1) The murre normally guards its egg continuously during incubation; (2) murres which incubate in close proximity in colonies respond to the loss of a neighbor by showing great uneasiness, especially if the loss leaves their territory altered markedly; (3) among the birds which I have observed the murres never seemed to recognize the Great Black-backed Gull as an enemy, and they never indicated any objection to the presence of the gull working around the colony to collect any egg which was not being hovered; (4) I never saw a murre show the slightest interest in any egg except its own;[2] (5) once an entire colony has left the eggs each individual fears to be the first to return, so the eggs may be left unprotected for hours—returning Auks and Puffins which nest among the murres frequently are of great influence in leading the murres back to their eggs; (6) an egg left unattended is likely be pushed into some inextractible position in mud or filth by the movements of the crowded birds; (7) while a murre can move her egg readily and she usually does insist on holding to the original location as a place to incubate.

Field Observations

Large colonies nesting on the surface of islands where there is little or no natural cover find the needed sense of security in their very numbers. A disturbing force which endangers this security may be easily introduced yet halted only after the entire unprotected portion of the colony has been lost. Something like this appears to have continued on the Farallone Islands since the birds have been protected from the human element. If we consider the report, for example, of Taylor (1887), with that of Chaney (1924), relative to the effect of the Western Gulls on the murres of the Farallones, we find that the murre population has continued to decrease. Taylor says, "The California Guillemot (*Lomvia troile californica*) lays its large pear-shaped

[2]In the summer of 1938 I saw one adult adopt an abandoned egg after the original one was lost to a gull.

egg on the bare rocks in any position and colonies of them are to be seen sitting together covering their eggs.... Their great enemy is the Western Gull (*Larus occidentalis*) for the latter is a ruthless pirate and steals and eats the eggs of other birds, especially the Guillemots at every opportunity. A murre is sometimes attacked by the gulls one on each side, and so harrassed, until one of the gulls gets the egg which he divides with his fellow pirate."

Chaney (1924) after visiting the Farallones in 1923 reports conditions after the birds had been protected from human robbers for many years showing that the murres have continued to decrease. He states, "Only three small groups were actually seen to be breeding. In each case they laid their eggs in crevices large enough to accommodate from seven to fifteen birds.... According to the lighthouse keeper the small number of nesting murres become discouraged, after one or two attempts at nesting, because of the attacks of the gulls. The selection by the murres of crevices in the rocks as breeding places suggests that they have felt the need for protection.... It seems probable, therefore, that the small number of breeding murres is indeed to be largely charged to interference by the gulls whose numbers are said to be greatly on the increase."

In this report Chaney gives us a sad picture of what has happened to a group of breeding birds which as late as 1885 (Wheelock, 1912) produced three hundred thousand eggs for the market.

Keading (1903) gives his observations of the gull damage at the Farallones as follows: "It is no uncommon sight to see a flock of gulls hovering over a nesting colony of murres in an effort to drive them from their eggs, and seizing every egg that is exposed. Should another cause drive the murres from their eggs, the gulls reap a harvest. This is perhaps as potent a factor as any in the destruction of the murres. For, while the human eggers took only the fresh eggs, they disturbed the whole colony of murres and the gulls took every thing in sight."

In this paper I wish to point out that by the very nature of the murre's responses to fear, the gradual disappearance of that great Farallone breeding population nesting in a location exposed to gull damage was an inevitable consequence of the disturbance by human eggers. They struck the vital blow at this great colony.

On the north shore of the Gulf of St. Lawrence where I made a study of the Atlantic Murre nesting on the islands where there were Great Black-backed Gulls nesting I could call attention to the following points in their relations: (1) On islands where both species are

nesting out in the open, the gulls take a certain percentage of the eggs regardless of disturbance. (2) If the murres are disturbed the damage may be anything up to complete loss of the murre colony. (3) On islands where the two birds are both found nesting, and the murres are protected by being down in crevices, caves, or faults in the rocks, the gulls are not likely to get many of the murre eggs; however, if the murres are disturbed a few times by man they may abandon, even at later dates because of gull cries to which they have become conditioned. ((4) Gulls which have lost their eggs by accident or because man has destroyed them as an attempt to control the gull population do not appear to leave their nesting territory any earlier than those gulls which rear young. As a result of general commotion which they set up because of the loss of the first set of eggs, the fuss they make in rebuilding the nest, and the general lack of demands on their time which the feeding of young birds would preclude, they are, at times, more serious enemies to other nesting birds than individual pairs of gulls which are allowed to breed normally. A pair of these gulls with young to feed appear to spend most of their time searching for food along the tide flats, whereas one without young spends most of its time watching from some crag or high rock in the nesting colony ready to take any unguarded egg or young bird of another species which may appear. It is this unoccupied group of gulls that I found were taking the greater portion of the unguarded murre eggs and newly hatched Eider ducklings. (5) On large islands where the gulls are nesting somewhat away from the murres any amount of disturbance among the gulls does not appear to affect the murres so long as they are never visited by man. They only become sensitive to the gull restlessness after they have been frightened two or three times.

Records of Experiments

At Wolf Bay in 1931, while studying the birds on Murre Island I discovered that there were about thirty pairs of Great Black-backed Gulls with their territories scattered about among six small nesting groups of murres. All the murre groups were more or less accessible to full attack. One colony was studied almost continuously over a period of several days from a blind placed in a fault in the rock nearby. This blind was completely concealed from murres and from gulls. It was entirely below the level of the surrounding surface of the island and was thatched over the top with weeds and fir boughs so that the birds walked across the cover without recognizing any change in the surroundings. In this blind I had a bed and food so that I could remain there for two-day periods. After a few hours in

the blind the birds were unconscious of my presence. The long stays were sufficient to allow them to settle down and to be studied under nearly normal conditions. The murre colony near this blind had 123 eggs originally. A few yards to one side of the murre colony was the nest site of a pair of blackbacks. The gulls had lost their eggs and, although it was past egg-laying season for them, the male repeatedly, each day, would get on the old nest and call the female. Usually she would stand nearby while he worked at the nest materials for some time. Then he might stand on the rocks by the female for several minutes. After this he would walk the twenty yards or so to the murre colony which he would approach along the highest ridge of the island. From the edge of the shallow, wide crevice in which the murres were located he would look all around to see if any egg was exposed. If he saw an egg exposed he would walk around to approach it without flying directly down among the incubating murres. I never saw the gull attempt to take an egg while a murre was incubating it, or approach a murre closely enough to receive a thrust from the sharp beak. When the gull was near one could sometimes hear a low gutteral sound from a murre which sounded like "auw", but no murre (not even the unoccupied ones) ever showed any inclination to drive the gull away from the colony. This colony was conditioned to fright because of my appearance when getting into the blind. As the more timid birds delayed the return to their eggs the gull feasted upon these. Thus progressive loss of the colony continued until there were eighty-two eggs remaining. At this time I left the island. When I returned a week later nothing remained but the empty shells of the murre eggs. Apparently the abandonment had been precipitous after a certain point.

The following notes taken from the blind described above will give a picture of the activities of these birds:

"July 14. I am in the blind at 'I' colony to observe the murres, 108 remain. Six egg shells were picked up this morning from the rocks here. One entire section of the colony containing fifteen eggs in an exposed position has disappeared.

"4:15 P. M. A Great Black-backed Gull came and took a murre egg. It ate the contents and left the shell on the rocks. 5:30 P. M. The murres are back on their eggs; this pair of gulls which have an empty nest nearby have finished the fourth murre egg in an hour. All the shells are on the rocks in front of the blind. 6:45 P. M. The gull chattered once and several murres left their nests, but a few stayed. The old gull calls his mate to their nest site in the same manner as

when he has food for her. Then he gets on the empty nest and turns about cooing in a way that reminds me of a pigeon. The female gives little attention, but he remains on the nest for some time. 7:15 P. M. The gull has been on his empty nest for half an hour while his mate stood alongside. 7:30 P. M. The gull got off his nest, called to his mate and walked along to the murre colony, picked at three shells which he had left earlier on the rocks and then went down after another egg which, finally, he could not reach. Then he cleaned up around the fourth shell left earlier in the evening. 4:30 A. M. July 15. All is quiet about the murres. The gulls have just taken another egg and left the shell on the rocks. 8:35 A. M. The gulls on the island gave a series of calls which caused most of the murres to leave their eggs. Some have not flown but are standing on the rocks looking about. It is always the male gull of the same pair which comes to this colony. 11:10 A. M. The gull got excited about something which frightened the murres. Most of them flew away from the colony. Some are coming back. 11:20 A. M. The gull is back. He went part way down in this wide crevice and came out with the shell which he left there this morning when I could not see what he was doing."

It should be noted that in connection with the above study that a pair of Great Black-backed Gulls which had three large young at a distance of not more that forty yards never approached or appeared interested in the murre colony. Other murre colonies on the same island were destroyed, however, in the progressive manner as indicated by the notes above. Of the several pairs of gulls living there most of them had been robbed of their chance to rear young. Human robbers had taken the gull eggs.

In 1934, while studying the birds on the east island of the St. Mary's group I found the murres were nearly all located in deep crevices where the gulls could not get the eggs. Here, too, most of the gulls had lost their nests. One pair of these gulls I knew particularly because it occupied a territory within sight of my tent. Most any time of the day one or both of the birds could be seen standing on a high rock overlooking the surf. Here was their territory and their perch. For the most part, they seem to wait there until food was in prospect and then go after it. When a brood of young eider ducks appeared these gulls were after them. They seemed always ready for such an occasion, but otherwise to have little to do with their time. Here, on the St. Mary Islands in 1934 I found the murres very readily became conditioned to gull warning as they did at Wolf Bay in 1931, although the gulls could not get to the murre eggs in most cases. Six

small colonies were studied by me during the two years, with as much caution as possible to prevent frightening but with a total record of ten to twelve visits for each colony, no handling of the adults being attempted. In these colonies there were originally 250 eggs. From these thirteen young were hatched of which five survived to go to the water (see Table 1). Murre colonies should be studied or observed for the most part by means of a concealed approach, especially if gulls are present to announce one's arrival.

TABLE 1. Showing the Effect of Disturbance on Colonies Which Were Visited Several Times During the Incubation Period, Although Precautions Were Taken to Prevent Frightening the Birds.

	Original No. of Eggs	No. Eggs Abandoned and Lost	No. Eggs Hatched	No. Young to go to Water	No. Colonies
Gull Island, 1931	43	39	4	1	3
Murre Island, 1931[1]	191	189	2	1	6
East Island, 1934[2]	16	3	7	3	1
Total	250	231	13	5	10

CONCLUSIONS

1. The murre normally nesting in colonies on remote islands or inaccessible cliffs, has not evolved a series of responses which permit it to adapt to repeated disturbances in a way to promote the preservation of eggs. The greater degree of adaptation appears to be in its ability to re-form a breeding colony and produce a new crop of eggs.

2. Breeding colonies of murres which are located in the range with Western Gulls or with Great Black-backed Gulls may be seriously affected either by a pressure from excessive numbers of gulls or from a fear conditioning resulting in gull predation of the eggs or the abandoning of them in locations not accessible to gulls.

3. This fear reaction is a colony response although it may start in one individual. At first the flight from the breeding site will not occur until the colony has experienced a series of stimuli ending in contact with a predator. After the conditioning the complete series of responses is set off by the warning stimulus.

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[1]The colonies on Murre Island were located so that the gulls could take and they did take most of the eggs.

[2]The small colony on East Island in the St. Mary Islands which was studied during 1934 hatched a larger number of young than other colonies used in the study. There were no gulls nesting near this colony, a condition which made it possible to approach with less disturbance.

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GOOD LANTERN SLIDES OF BIRDS

BY GEORGE MIKSCH SUTTON AND OLIN SEWALL PETTINGILL, JR.

The making and painting of lantern slides is a somewhat neglected corner on the field of Bird-Art. Photography has advanced. Technique has developed. Never do we attend an ornithologists' convention these days without being thrilled by new camera bird-portraits brought from far and near. Yet we continue to see lantern slides of these very photographs that are less interesting than they should be, poorly composed, and badly painted.

We purpose to present here some suggestions regarding the making and painting of lantern slides of birds. Assuming that photographic methods are understood, we suggest first that slides be printed by projection rather than by contact. This permits the enlarging of the small bird-image on the negative to any desired size. It permits the elimination of details in foreground or background that are unnecessary or out of focus, or that tend to destroy the center of interest. And it permits a proper framing of the slide.

Enlarging is important not alone because we usually wish to see the bird first of all, but because the larger image of the bird itself gives us an opportunity to paint in details of feather-pattern that would otherwise be missed. The elimination or subordination of inconsequential parts of a picture is important unless we are interested primarily in showing the bird *in its habitat.*

The framing of our subject is important. Thus, if our bird is flying, we must remember to allow more space in front of it than behind. If a flying bird is exactly centered, the slide is likely to appear crowded unless the bird-image is kept small. If we are framing a flock of flying birds it is well to avoid cutting any bird in two; and it is extremely bad to leave on the slide the rear half of a bird. A bird that is standing still may be centered. An owl that faces us may be centered. But a bird that is walking must have plenty of space in front of it—at least as much space in front as behind. And if the whole bird is shown, the head or eye, and not as a rule the body, de-

termines the center of interest, so that the body often should occupy a lower corner or lie within the lower two-thirds of the finished slide.

In printing much care must be given the matter of exposure. The success of a colored slide greatly depends upon this one step in the process. If a slide is underexposed the colors are likely to be blotchy and overbright, no matter how carefully they are put on, and they tend to bury details that should show. If, on the other hand, the print is overexposed the effect will be muddy. Nor can this muddiness be corrected with any amount of laying on of color. If overexposure is bad the whole picture is dark and colors that are added make it darker, not brighter. The only slide that can be colored satisfactorily and at the same time with ease is one which has been properly exposed; one which shows good detail and a degree of contrast. Getting this proper exposure often means several trials, alternating with each trial the length of exposure and the strength of developing fluid. A slide may, of course, show too much contrast, the blacks too black and the light areas too white. Such a print lacks detail and is to be discarded unless a purely artistic effect is desired.

It is always a good plan to project a slide with the lantern before undertaking to color it. This permits us to make a new and better print, if necessary, and to proceed intelligently with the painting.

In making a slide that is *not* to be colored, the usual acid fixing bath is desirable. This acid fixing bath should not be used, however, with slides that are to be colored, for it has a tendency to harden the gelatin so much that the water (and therefore water-color) is repelled. A slide that is to be colored should be fixed in a bath containing hypo and a 2.5 per cent solution of sodium bisulphite. This bath will not harden the gelatin; consequently, if the slide is held over a warm light while it is being painted, or if the temperature of the room becomes too high, the gelatin may become so soft that the brush will dig into it. Should this occur, the slide should be dipped two or three times in a 2 per cent solution of formalin, then thoroughly rinsed and dried before the painting process is resumed.

Now for the coloration. In most slides a large part of the background is light in value—this lighter part frequently being the sky. When first we began painting slides we gave all this lighter part—indeed sometimes the whole slide—a light blue tinting, using a big soft brush and plenty of water. Such a general tinting of any slide is a mistake, first, because it tends to make the whole picture dull; second, because it gives color to certain parts of the foreground which should remain *entirely uncolored* or which should receive colors of a

different sort than blue. In twigs that cross the sky, for example, there are nearly always highlights that are dominantly yellow or red and not blue. It is a bad mistake to deaden such reddish or yellowish tones with an indiscriminate blue wash before painting them.

What we have just said about the undesirability of toning down any large part of a slide with blue is even more true of green. How many slides have we seen in which some unfortunate, sickly shade of green is smeared all over that part of the photograph showing grass or shrubbery! Of all the colors that we find in nature perhaps none is so infinitely variable as green. In a single leaf there are a considerable number of shades, some of them the result of chlorophyll itself, others the result of colors reflected from the sky, from clouds in the sky, or from any number of surrounding objects.

In painting backgrounds where the blue or gray of a sky predominates, put this blue in in sections if branches cross, leaving the greater part of the branches wholly without blue. If cloud effects are desired, leave parts of the sky untouched with blue, using plenty of water so as to avoid hard edges anywhere. And leave untouched all parts of the foreground that in the finished slide should be strongly white, or yellow, or red. Parts of the foreground that are finally to be green may be washed with blue, for making these parts green means the superimposing of yellow—a simple process. But for reds and yellows a blue wash is fatal.

In painting backgrounds where greens predominate, introduce these greens in small sections, following a single grass-blade or a single leaf with one stroke of the brush, then changing the shade by adding a little brown or a little yellow or a little red for the leaves and grasses close by. In other words, break the green areas up into patches of brown, yellow, blue, red, and purple. Do not be afraid of overdoing the variety of shades. If you find your results a trifle too patchy, run them together by stroking the whole area with a water-filled brush, or by giving the overly spotted areas a faint bluish or yellowish wash.

The painting of gravel such as often surrounds a Killdeer's nest is not easy. A single tone of brown or gray will not do. Touch each prominent pebble with bright color—pinkish, yellowish, purple, or orange. The pebbles that do not show prominently do not matter much, but colors on those that receive the strongest light will give the slide sparkle.

The leaves of coniferous trees are not easy. Great care must be exercised in painting pine needles that show against the sky. The green must not be smeared across the distant blue; better far to leave

the needles unpainted altogether than to smear them in. And remember, too, that the colors of spruce boughs are often as gray or glaucous blue as they are green. Painting any piney woods means a constant fight against solid washes of green.

Bark, like gravel, requires spots of brilliant color here and there to keep it from being monotonous. Of course, there are limits: it would be a sad mistake to give aspen or sycamore or white birch bark an overdose of red; but bark should be treated as the green of a shrub is treated, with due regard for the variations of shade that occur everywhere as a result of reflection of color from surrounding objects.

Now for the birds. It is a good idea to have a specimen at hand so that shades may be carefully matched. Proceed with great care with any sort of general wash. Remember that any part of the bird that is white must *stay white* and not be touched with any wash unless it happens to fall in a shadow. If a white part of a bird falls in shadow that shadow is likely to be blue, not purple; and sometimes in the shadow there will be a hint of yellow or orange or brown or green reflected from surrounding objects. White birds, such as gulls, against a blue sky are among the most difficult of subjects. Here no blue of sky must cross the white plumage that is struck by the sun. This means painting the blue of the sky directly and very carefully up to the bird's body and no farther. Keeping the blue even and at the same time not smearing it over the bird is sometimes exceedingly hard. A mistake may necessitate washing the slide completely and beginning all over. We may someday discover some substance (such as rubber cement) that can be put on the figure of the bird that will permit us to proceed with a broad painting of the sky, remove our temporary coating, and finish the bird; but by that time we may all of us be able to photograph directly in color, and the painting of slides will be outmoded.

Wherever there is a center of interest in our slide there should be a strong light, hence sharply defined highlights, deep shadows and pure colors. This usually means the use of some heavy color such as purple or thick black, placed with great care in the deep shadows beneath eggs or in the darkest part of the pupil of the eye. Be the print before us ever so sharp and clear, and its darkest parts ever so dark, the adding of this heavy black, in opaque color, will add depth to the slide and produce a three-dimensional quality that is sometimes very striking.

The use of opaque color involves a special technique. Mixing a heavy black with a transparent blue, it is possible, if we work quickly, to give such a color area as the black crown of a tern a wonderfully

rich, glossy appearance. We ought to have some sort of transparent paint with which to step a neutral tone gradually down with application after application, but we have thus far not found such a paint. The "stone gray" that is usually included in books of lantern slide colors is hopelessly granulated. We rarely find it possible to use this color at all. So, as a rule, we resort to thick black, that may be mixed with blue or green where glossy plumage is involved; or, in achieving a gradually darker shade, to color after color superimposed in such a way as to neutralize each other.

This toning down of some objectionably light part of the slide is an interesting process. Suppose one corner of our print is for some reason far too light; or that a waving grass blade or leaf crosses in such a way as to produce a disagreeable effect. It is rarely possible to correct such a flaw with heavy opaque; usually we want to tone it down or to efface it by merging it with the background. To do this, put on first a bold, bright layer of pale pink. Put over this a layer of thin green. The resultant queer brown must be overlaid with purple or yellow or any other shade that is needed for neutralizing. Spotty effects are likely to result, of course. These spots must be handled individually. Each application should aid in the neutralizing process and gradually darken the tone. Bear in mind the complementary colors. In toning down what appears to be too strong a green use red; in neutralizing purple use yellow; and so on. The effects of such a treatment are often highly satisfactory. Even so difficult a spot of white as that which results from a finger nail scratch on the negative may be completely obliterated with a treatment of this sort. Be careful, however, in doing this, for an area so treated is likely to become dark with surprising rapidity.

The use of opaque colors, either heavy black or pure purple, is helpful in strengthening shadows. This is particularly true with such subjects as nests or birds on the ground where certain grasses and leaves are out of focus. Prints that are at first sight a hopeless blur may be given defiinition or brought into focus through the wise use of opaque color.

The use of opaque color in retouching a negative is a field of its own upon which further experiments may well be made. In building up our series of slides we occasionally come upon a photograph of some bird whose coloration is bright, but in which these bright areas appear very dark, even blackish, in the print at hand. Such is likely to be the case with a tern whose beak is bright red or orange; a ptarmigan whose comb is bright red; a Ruby-crowned Kinglet or a Red-

poll. These bright colors frequently "go dark" in the process of being photographed, so dark as to be quite beyond us in our painting unless we radically change the negative and print.

We have had good success in thus doctoring an occasional negative. In a Redpoll portrait, for example, we opaqued the red cap so completely in the negative that in the print it appeared a glaring, impossible, altogether flat white. But by applying proper tints we gradually brought this cap down to the proper shade of red, with the result that we now have a slide that is interesting and that shows a real Redpoll, not a Redpoll with a sooty crown.

Some persons will brand this doctoring of negatives as "Nature Faking". And, to be sure, that is just what it is. The whole business of photography is a nature-faking business. What we get in our final, unretouched print often is a far cry from what we actually saw at the time our photograph was taken. What we want in our final slide is the best likeness we can achieve of our subject. The light has played tricks on us. The camera has failed miserably in catching shadow-color. Parts of our subject are out of focus. Our task is to build up, as best we can, images of the subjects that will do them justice.

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CENTRAL WISCONSIN CRANE STUDY

BY F. N. HAMERSTROM, JR.

Sandhill Cranes (*Grus canadensis tabida*) are among Wisconsin's rarest breeding birds (Henika, Scott). The fact that a few cranes persist is due more to the tolerance of a few landowners than to any direct action toward maintaining or improving crane habitat. Although they are legally protected, protection alone has not been enough to swing the balance in their favor.

The chief reason for this casual treatment of so rare a bird seems to be lack of definite information upon which to base a program of active conservation. To make a start toward the needed factual base, in 1936 and 1937 a brief crane study was made as a part of the research program of the Central Wisconsin Game Project, Necedah.* The purpose of the study was to map the position of the crane ranges on and close to the Project and to learn something of the character of

*Farm Security Administration, Project LD-WI-5.

Acknowledgments: Field assistance—James Blake, Burns Carter, J. R. Goodlad, Oswald Mattson, and Millard Truax, members of the Project game staff; and Frances Hamerstrom. Review of this paper—Mr. W. T. Cox, Regional Forester-Biologist, Region II, F. S. A., and Professor Also Leopold, University of Wisconsin.

these places as a first step toward developing methods for increasing the population; in other words, crane management. The term "range" is used for areas in which fairly definite numbers of cranes are found fairly regularly during the breeding season. This paper is based upon a study of seven ranges which have been used for at least the last five years, and in most cases considerably longer. Their locations and the number of cranes in each are given in Fig. 25, which also includes four other places frequented by cranes. One of these, the Potter unit, is probably a definite range; a second, the Hog Island unit, may be a range newly established in 1937. The Daly and Norway Ridge units are probably feeding grounds for known ranges nearby.

Description of the Country

The area covered lies in the southwest part of Wisconsin's central plain. Soils are of two major types, sand and peat, both acid and lacking in essential plant foods, with a high incidence of frost in the peat areas. True prairie, at least in post-glacial times, has never been present in the area in significant quantity (Thomson), but once came within a few miles of its western side (Schorger).

Land industries are general farming, low-grade dairy farming, cranberry growing, and seasonal harvesting of sphagnum moss, marsh hay, and blueberries. About 100,000 acres near Necedah are being developed for wildlife by the F. S. A., following the removal and resettling of the resident farmers.

Except for a few bluffs and sand ridges, the country appears to be flat. The plain is actually a mixture of low marsh basins and slightly higher sand islands, undulations in the former bed of glacial Lake Wisconsin. The whole pattern is cut through by many drainage ditches. The basins, single or in southeast running chains, once held timbered swamps, bogs, and open marshes of from twenty to several thousands of acres. White and red pine grew on the sand islands and ridges, but were stripped clean during the lumbering days.

Repeated fires followed artificial drainage and destroyed most of the peat, as well as the forest duff on the sandy uplands. Aspen and willow have taken much of the burned peat, and poorly formed jack pines and scrub oaks have replaced the white and red pine.

The larger peat areas were more resistant to drainage, and to this fact, apparently, most of the remaining crane habitat can be traced. There a few tamarack-spruce swamps and leatherleaf-labrador tea bogs, small samples of original conditions, have persisted; but even in these places the ditchers were partly successful, and the swamps and

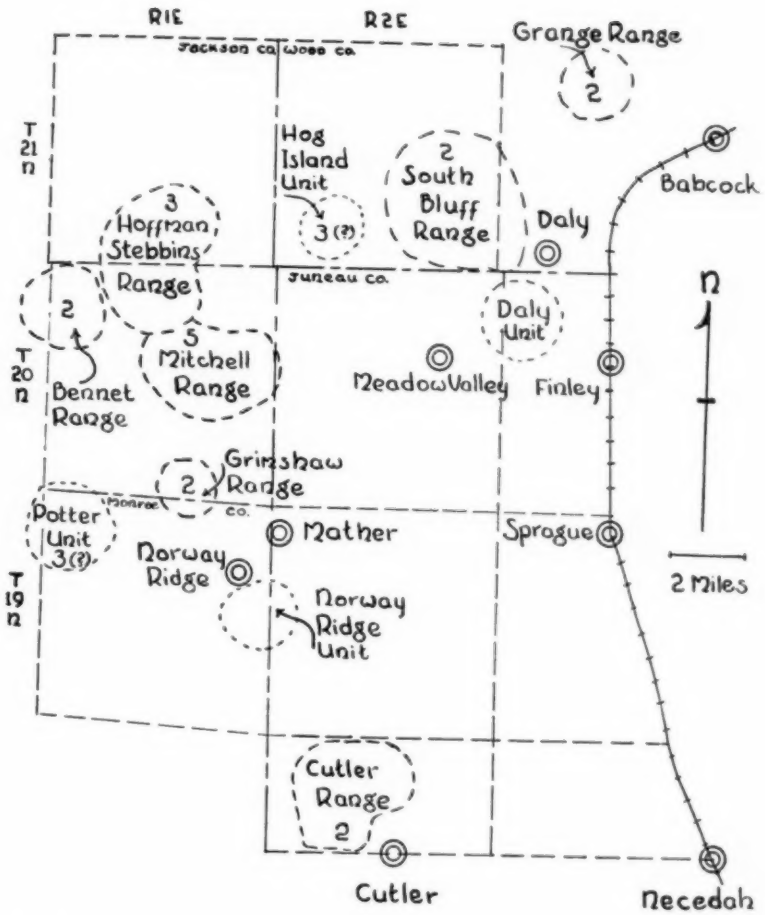

FIG. 25. Crane ranges, and the number of birds in each, in the study area.

bogs are associated with grass marshes and vast tracts of even-aged aspen, indicators of lowered water levels. Cover types, on the whole, occur in large blocks. Open water is confined to drainage ditches, a few breaks in the floating bog, and the impounded waters of the cranberrymen's reservoirs, around which over half of the ranges studied were centered. Fig. 26 shows the land forms of one such large peat area, containing three ranges.

One exception to this general condition was found: the Cutler range. It is an area of small marshes and sand islands and is more typical of the region as a whole than are the relatively few large peat areas.

What Is Crane Habitat?

We do not know exactly what the basic condition necessary for cranes may be, but it seems logical to assume that elements common to a number of ranges may include it or may produce it through their joint action. One element common to all of the seven ranges studied is the presence of areas of shallow water, over forty acres in size. These may be impounded waters—cranberry reservoirs, the ponds on the Cutler fur farm—or areas in which artificial drainage has been a partial failure. Cover types were floating sedge bogs, shallow grass, sedge and cat-tail marshes, and flooded aspen flats. Deep open water seems to be definitely less attractive.

A second common element is isolation. Although the cranes often feed in cultivated fields, and have some contact with the activity around cranberry marshes, there is usually a nearby area of a section or more in which the presence of humans is uncommon, except for such seasonal work as haying or mossing.

The invasion of marshes by aspen and willow, as already pointed out by Leopold, has a bearing upon both of these elements. Such invasion increases isolation, since hay and moss are no longer produced, but does away with the *openness* of the country, so uniformly associated with cranes in the literature. If an aspen flat is an acceptable substitute for open marsh, well and good. On the other hand, the presence of water may figure so prominently in the crane ranges because it keeps down brush invasion.

The large size of the ranges is one of their most striking characteristics. The smallest was somewhat over a thousand acres, the largest almost five thousand. In no case, however, was it all wild land. Cultivated fields, cranberry developments, and in one case a fur farm, occupied part of the range, although in each instance taking up less than ten per cent of the total. It would seem that the ranges are

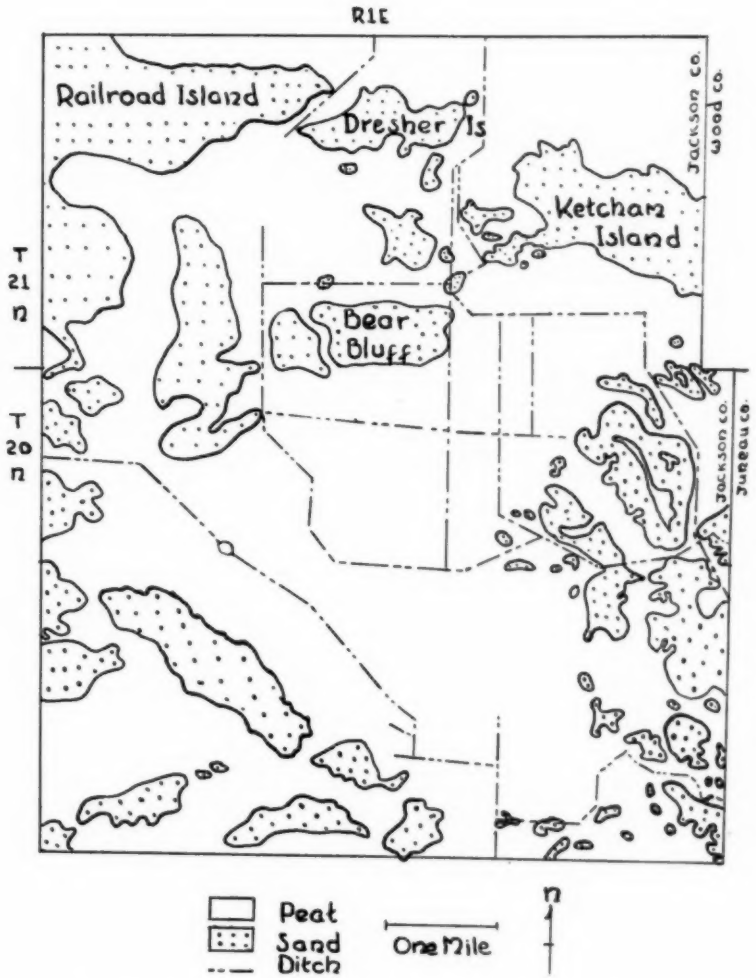

FIG. 26. Land forms in the northwest part of the study area.

made up of two parts: a relatively small nucleus in which particularly rigid standards must be met, and a much larger bordering zone which may be enroached upon to a far greater extent by unfavorable circumstances. Water areas, single if large or multiple if small, constitute the nucleus, while the bordering zone is the associated aspen flat–grass marsh cover.

The inclusion of a variety of cover types within a range, so characteristic of this nucleus and bordering zone arrangement, may or may not be an advantage. Long flights are made over aspen flats to objectives a mile or more away, suggesting that the great size of the ranges may be accounted for by the assumption that they include a scattering of favored spots within a vast matrix of unsuitable cover. Only twice were we able to find crane sign along the line of flight, in both cases in sedge openings similar to the nuclear portion of the range. Whether or not varied cover is an advantage, it is to be seen in the background of photographs of crane nests in Minnesota (Roberts) and in Europe (Berg). Berg, indeed, is of the opinion that edges of brush or dead timber are preferred nesting sites. An understanding of the exact relationship between these two parts of the range is probably the fundamental problem in crane management.

In all but one of the ranges studied—in fact, over the state as a whole (Scott)—all of these elements of crane range may be reduced to one common denominator: peat. Shallow water areas in large isolated tracts of open marsh and bog, swamp and aspen flat, occur in this region only in peat basins. It is not clear whether peat basins are preferred or are used because only they provide the size and isolation necessary for crane habitat. By their large size and limited economic productivity, areas of this sort are more suited to state control than are richer agricultural lands.

A final element common to all of the ranges is the presence of uplands, the possible importance of which as rearing grounds is mentioned in a later paragraph.

General Life History

There are about eighteen cranes in the ranges shown on Fig. 25, and about three more in the suspected Potter unit. Probably not more than one pair of breeders is present in each range, although the odd numbers in several ranges indicate additional non-breeders.

Dates of first arrival in the Hoffman-Stebbins range were: 1936, during an early warm spell in late March; 1937, April 9. The latter date is probably the more typical.

From the time of their first appearance until early summer, cranes in the Hoffman-Stebbins range were often seen in cultivated fields between early morning and ten o'clock, and again from about three until dusk. They were apt to be on the floating sedge meadow in the cranberry reservoir between eleven and three, although they often flew to the aspen flat, tamarack swamp, and floating bog country southwest of Bear Bluff instead. In early spring, one finds pairs or larger groups; as the season advances one is more apt to see single birds. In the other ranges, which were less intensively studied, the same general relationships seemed to hold.

Several of the cranberrymen have seen cranes dance on the marshes, and Mr. Griffen saw (May 12, 1937) what was undoubtedly the dance on a food patch on a high sand ridge near his house.

A nest containing two eggs was found by Goodlad and Carter on May 18, 1936, in the Hoffman-Stebbins range. By June 3 one egg had hatched, apparently the day before, and by the 5th both had hatched. One of the juvenals was in hiding about twelve feet away, the other ran about through the sedges, keeping within about twenty yards of the nest. The nest, a flat platform of sedges about twenty-four inches across and one and one-half inches high, had been built on a floating sedge meadow. Two clumps of four-foot willows gave slight concealment on two sides, while the other two sides permitted unobstructed vision across the three or four hundred acre sedge meadow. The floating sedge mat was thoroughly soaked, although the nearest open water was a ditch 100 feet away. Aspen and willow flats and sand ridges covered with pines and oaks surround the reservoir.

In the same year, a nest was found by Mr. Cleveland Grant in the South Bluff range. One of the adults had been killed on the nest, Mr. Grant thought by a coyote. This nest was also on a floating bog, in a rather open marsh. These two Wisconsin nesting places are essentially similar to three described by Walkinshaw in Michigan, and nine of the ten reported by Holt from the Kissimmee Prairie in Florida .

A nest was found some years ago in the Cutler range and I am told that cranes nest regularly on the Bennett marsh. Mr. Grimshaw noticed that the two cranes on his marsh behaved as though crippled when disturbed during the 1937 breeding season, and he regarded as juvenals two which remained for a time after the others had gone in 1936. It would seem, then, that nearly all of the ranges examined were actually breeding areas.

During the rearing period, cranes were very inconspicuous. It is probably during this time that the factor of solitude becomes particu-

larly important, for the birds practically drop out of sight. Except for young at the nest, reports of juvenals were seldom heard. Knute Olson, of Mather, told me that when he was surveying about twenty years ago he came upon two juvenals still unable to fly, although fairly large in size, in the marsh toward the southeast end of Hog Island. At that time the place was even less accessible than now, for there was much more water. If this basin, which is about four thousand acres in size, was a typical rearing ground it is not surprising that cranes are rarely seen during the rearing period. Whether they move deeper into the marshes with their colts or take them into the wooded uplands, as do their European relatives (Sieber), I can not say. If, indeed, the crane has taken to the marshes and swamps not from choice but from necessity, a dry ground stage in the development of the young is to be expected.

From late August until the southward migration the fall-gathered cranes, in a fresh grey plumage, again spend much of their time in the grainfields. Up to sixteen birds were seen in the Hoffman-Stebbins range in 1936, and Mr. Stebbins has seen as many as twenty in past years. Several of the marshes in Adams County, about thirty miles to the east, are concentration points for flocks of eighty to one hundred cranes, known to be migrants. From this disparity of numbers, it seems plain that the study area is not on the main migration route through Wisconsin, and that the birds which gather in the Hoffman-Stebbins range are of local origin. The same situation seems to hold in the spring, for while large temporary concentrations are seen in Adams County, there are no such spring stopping places in the area covered by this study.

The autumn flock was much more loosely organized than the small bands seen in spring, and often split into several parts. These may have been definite entities, such as family groups. Daily movements were more wide-spread, perhaps to prepare the juvenals for the long flight to come. The area south and west of Bear Bluff was much more frequently visited, and a greater part of it was included within the flight lines.

One of the first freezes in 1936, which came during the week of October 20, marked the end of their stay for most of the cranes. Two remained in the Grimshaw range until November 8, when they too left.

Marshes, except perhaps during the rearing period, seem to be the usual night roosting places. On one occasion, three cranes were seen at dusk on a sedge meadow at the edge of open water, and were watched until darkness had fallen. Conversely, observations begun before day-

light twice indicated that daily activity began in the marshes. We have many reports of cranes flying to the marshes at dusk and out of the marshes in the early morning.

The presence of cranes in cultivated grainfields has already been touched upon, but not sufficiently emphasized. Observations on feeding birds indicate that grains—particularly buckwheat, although corn and oats were also taken—are a large part of the diet in spring, early summer, and autumn.

Many of the autumn droppings were stained bright purple. From crane sign found along an elderberry thicket, Goodlad and Carter were of the opinion that these berries produced the color. According to their observations, grasshoppers and crickets were eaten at the same season. To test the value of food remains in the droppings as an index to food habits, thirty fresh fecal passages, distinctly purple in color, were collected from a buckwheat field on September 26, 1936. Lack of equipment made a thorough analysis impossible. With a hand lens the hard seeds of huckleberry (*Gaylussacia baccata*) and blueberry (*Vaccinium* sp.), fragments of the legs and wings of grasshoppers (*Melanoplus femur-rubrum*) and of the legs and elytra of a few unidentified beetles (*Coleoptera*), with a few bits of unidentified twigs, were separated from the buckwheat hulls and seed coats which made up 81.9 grams of the 82.8 grams of air-dried material.

Soft plant and animal matter would probably be unrecognizable, but dropping anaylses might well be used to good advantage to supplement direct observation of feeding birds.

Conclusions

Our findings may be related to the purposes of the Project in four ways:

(1) The minimum unit of land for crane management is about 1500 acres in a single block.

(2) Large areas of deep peat are most suited to crane management and should be reserved for that purpose. There is one such area within the Project, which was used by cranes before it was drained. It is being partially reflooded. Certain of the smaller reflooded marshes, particularly where linked together in a series, may also offer possibilities.

(3) On the blocks reserved for crane management the present gridiron pattern of roads, heritage of a C. C. C. invasion, must be broken up. Gates placed on bridges crossing the drainage ditches and destruction of side trails by flooding would prevent general automobile travel without seriously interfering with fire patrol. If this be not

done, the Project will defeat one of its own original purposes; namely, crane conservation.

(4) Food patches of corn or buckwheat should be maintained in occupied or prospective ranges to replace the grain fields lost through the removal of farmers.

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A LIFE HISTORY STUDY OF THE YELLOW-BREASTED CHAT

BY GEORGE A. PETRIDES

In an effort to increase the photographic record, as well as to add to our knowledge of the life-history of the Yellow-breasted Chat (*Icteria v. virens*), two nests of this species were studied during the nesting season of 1937. This enterprise was carried out under the direction of Dr. Paul Bartsch of The George Washington University, whose gracious loan of photographic equipment made possible the pictures here reproduced.

Photographs of the chat are extremely rare. To the best of my knowledge, the two pictures taken by Dr. A. A. Allen are the only ones, until this date, that have appeared in the literature.[1] This species is the shyest of the warblers and although often heard it is but seldom seen. Once the bird realizes that it is observed it becomes silent and moves about only furtively. The parents are silent about the nest and the discovery of the nesting site is accomplished only by systematic search. Many investigators emphasize the extremely timid nature of the chat and some have stated that the parents will leave their eggs

FIG. 27. Nest and eggs of the Yellow-breasted Chat.

FIG. 28. The female Chat resting at the nest.

or young on very little provocation and that even slight disturbances of the nest or the leaves around it may cause the birds to desert.[1]

In the present study, although the birds of the first nest were "conditioned" somewhat by a gradual encroachment upon their nesting territory, the second nest was approached noisily through the underbrush on six different occasions and the contents lifted out and handled. Despite this, there seemed to be no evidence of a tendency to desert and on all occasions the adults were seen or heard about the nest and the young hatched and flew normally.

Some caution was exercised in preparing the birds of the first nest for study in the case that these individuals were as timorous as reputed. The blind, a green umbrella tent six and one-half feet high, was first erected some eighteen feet from the nest and moved forward about four feet every other day until, when the eggs were hatched, the tent was only two and one-half feet from the nest. On each visit several leaves were plucked from before the nest until it was well exposed.

It was not possible to identify the sexes in the field but it was concluded that the brooding bird was the female. (It appeared somewhat bedraggled and slightly less intense in color). She was no more suspicious than a bird of any other species and indeed she became quite tame for, despite the proximity of the blind, only very sudden sounds and movements disturbed her. It was possible to stand outside the blind, beside the nest, without flushing the bird. Throughout this study the behavior of the birds of the two nests was in marked contrast to that described in the literature.

The nests were the usual bulky structures composed of grasses and placed in typical positions three feet from the ground in grape and blackberry vine tangles. The first nest was discovered on June 13, 1937, and at that time contained one egg. On the 15th there were three eggs (Fig. 27). The second nest was found on the 19th and also contained three eggs. A visit on the 25th showed three eggs still in each nest, but on the morning of the 27th there were, in each nest, three small young which had undoubtedly hatched late the day before. Thus the incubation period was eleven days from the appearance of the full clutch. F. Burns,[2] however, records an incubation period of fifteen days for a pair of Vermont birds.

The young were born naked—the feather tracts showing dark blue on the wings and less darkly on the back.[3] The primary quills did

[1]Bird Lore, Vol. 21, No. 2, 1919.

[2]Wilson Bull., Vol. 27, 1915, p. 286.

[3]A. A. Saunders in Forbush's "Birds of Massachusetts" (III, 1929, p. 298) says that the chat is the only warbler that he knows that does not possess natal down.

FIG. 29. The female Chat cleaning the nest.

FIG. 30. The female Chat shielding the young from the sun, often called brooding.

not project on the day after hatching (27th) although on the 28th they were about $\frac{1}{16}$ inch long and on the 30th about $\frac{3}{8}$ inch. By the 2nd they had developed sufficiently to enable the young to fly.

On July 1 three young were present in both nests but on the 3rd, when the nests were again visited, they were empty and no chats were seen, although several notes were heard near the second nest. Thus the young developed to the flying stage in the period from June 26 to July 2—a period of eight days.

Brooding of both eggs and young was accomplished by the female alone during the time of observation, and although several attempts were made by the male to feed the young, his shyness caused their failure. It did not appear, however, that the male ever brooded the eggs or young.

The food of the young consisted almost entirely of soft-bodied orthoptera and larval lepidoptera. The only insect definitely identified was the large green mantis (*Paratenodera sinensis*), two half-grown specimens of which were fed the four-day old young. An unknown species of brown, almost hairless caterpillar was the greatest capture in numbers. A small green long-horned locust and a small brownish grasshopper also were fed the youngsters.

The four-day old young were fed only six times in five hours by the female, although the male attempted unsuccessfully to feed them several times. Copeland,[4] however, records a feeding time average of once every thirty-four minutes for the four-day old young over a thirteen-hour period.

The nest was kept very clean and the female, after feeding the young, would look carefully about the nest and if any excretory capsules were present she would pick them up in her bill and eat them. On one occasion after swallowing the excretory sacs of two of the young she pulled a third capsule from the anus of the third and flew off with it.

On or about the nest the female—and the male on occasion—uttered notes that may be classified in ascending order of alarm as follows:

1. A mild chatter in the throat, a gargling growl.
2. Clapping of the mandibles, rarely given.
3. A chuck-ing note given singly or as *cuk-cuk* or *cuk-cuk-cuk* in a rapid and sharp manner, quite common.

[4]Wilson Bull., Vol. 21, 1909, p. 42.

4. The more common, scolding chat note given in a nasal tone and most conveniently written "*cheow*", given sharply and usually singly.

These notes, some of which were always given when another bird species approached the nest bush and sometimes when other noises occurred. The first type was given when the bird was on the nest and apprehensive of intruders while the third type seemed to be given to attract the attention of the male while he was singing. The fourth is the most common alarm note and often preceded a flight from the nest. The nest was often quitted silently, however.

The male of this pair sang in spurts from first one direction and then another while the blind was occupied. His calls were only occasionally answered by his mate and although Townsend[5] records the chat imitating other species, this pair did not show that tendency despite the fact that a nearby Mockingbird whistled crudely like a chat.

The male of this pair also occasionally performed its clownish "courtship" flight-song given with "dangling legs, pumping tail, and slowly flapping wings". There did not seem to be any excuse for this performance at any time, however.

Summary

The reputed timidity of this species advised a gradual approach of the blind to within three feet of the nest and the gradual removal of leaves surrounding the nest. The female bird became quite tame and no difficulty was experienced in photographing it. A second nest was visited often and the contents handled but, contrary to reputation, the young were hatched and flew normally. The suspicious nature of this species is believed over-emphasized in the literature.

From data on both nests the incubation period was found to be eleven days, and the young spent eight days in the nest before leaving. The young were born naked. Brooding of both eggs and young was accomplished by the female alone during the period of observation, although both sexes evidently feed the young.

Their food consisted of soft-bodied orthoptera and larval lepidoptera. *Paratenodera sinensis* (mantis) was identified but the species of locusts and caterpillars were undetermined. The four-day-old young were fed only six times in five hours. The cleanly habits of the bird were noticed.

Four different types of notes uttered by the female at the nest are given in ascending order of alarm.

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[5]Auk, XLI, 1924, p. 548.

RELATION OF TEMPERATURE TO EARLY MIGRANTS

BY JOHN S. MAIN

In an article by Bissonnette entitled "Photoperiodicity in Birds", in the WILSON BULLETIN of last December, there is an interesting discussion of the spring migration, and of the factors that operate to make the birds start. We are referring now not to the physiological changes leading up to the migration movement, nor the cause of these changes. As to that there is a wide difference of opinion among the physiologists themselves. Rowan, it appears, now favors the effect of increased exercise upon the gonads, having abandoned his original theory as to the direct effect of light. Bissonnette suggests an inherent rhythm of the anterior pituitary controlling the sex cycle, with light as an auxiliary. Kendeigh believes that environmental conditions are the efficient agent, acting both directly and through the medium of the endocrine system. Some stress food, some the thyroids, others the declination angle of the sun.

What we are here concerned with, however, is not the so-called conditioning process, but something quite different. It is the actual moment of departure, and the forces that finally arouse in the bird an uncontrolable impulse to begin its northward flight, for there is reason to believe that another factor becomes dominant at this time and furnishes the stimulus for action.

The agent above referred to, at least in respect to our early migrants, is none other than temperature. And yet, strangely enough, none of the persons mentioned by Mr. Bissonnette, with the single exception of Kendeigh, seem willing to admit that this is the case; and when evidence is adduced showing that when temperature is higher than usual, migration is earlier, it is dismissed with the statement that the warmer days may be due to less over-cast skies. That this explanation is not a sound one I believe the following remarks will show.

I must here take the liberty of referring to an article that appeared in the WILSON BULLETIN (XLIV, 1932, 10-12) a few years ago, in which I reviewed an abnormally warm week in February of 1930. In that week, starting with the 17th, all previous heat records were broken, not only for the Madison region but for hundreds of miles to the south, the average temperatures being from 23 to 28 degrees above normal. This warm wave was accompanied by an abnormally early migration. Of seven species of small birds that are commonly the first to arrive, all appeared from two to three weeks

before their usual time. In fact, their return, in nearly every case, antedated by a week or more any previous record.

What was the meaning of this coincidence of warm weather and early migration? Since it is well known that the temperature at the place of departure is more important than that at the place of arrival, an examination was made of the records from various stations of the U. S. Weather Bureau as to the temperatures that prevailed to the south of us during the period in question, and it was found that the reports from all were substantially the same. For example, a station 150 miles to the south gave the following summary: "Warmest February but one in 75 years. The week ending February 25 was the warmest winter week in 50 years or more, and as warm as the normal last week in April." The answer to our question is obvious.

I was interested to see that Roberts, in his recently published "Logbook of Minnesota Bird Life", makes the same observations, both as to that year and the year following, to which reference will presently be made. His data as to temperature and arrival dates corroborate those above given, as well as the conclusions arrived at.

But what about the sunlight? Could not that have been a contributing factor? As to this, the answer is simple. Both in January and February of that year the hours of sunshine throughout the region were less than normal, while for the days during which the migrants must have been starting the hours of sunshine averaged very much less than normal.

Another circumstance may well be mentioned. It so happened that February of the following year was also exceptional, being even warmer than that of 1930. In this case, however, the heat in the winter home of the migrants was more evenly distributed, the week starting the 17th having a mean temperature of only 10 degrees abov. normal. The result was that, even though the hours of sunshine were greater than for the same week of the previous year, the migrants referred to did not appear until much later—in fact, not appreciably before their usual time.

Cole, in his experiments with Mourning Doves, showed the effect of sustained light in hastening reproductive activity, but he also called attention to the fact that on a chart graphing the spring migration of doves over a period of years, there was no correlation between their northward advance and the increasing length of day. Supplementing this, examinations made of early migrating blackbirds this spring, at the University of Wisconsin, showed no enlargement of the gonads or other indications of sexual activity.

It is obvious that physiological changes induced by light do not take place overnight, but are a gradual process. In experiments made by Cole and Rowan two months or more were required to activate the gonads, even under forced lighting conditions that simulated continuous daily sunshine. Migrating birds, moreover, show no preference for clear days over cloudy ones. Indeed, the great majority of our small birds travel chiefly by night.

Returning to the subject of temperature, Roberts, in referring to the birds first seen in the spring, says: "These are the birds that migrate on a temperature schedule and are early or late as the spring is early or late."

Kendeigh, following a similar statement, gives an excellent description of bird waves. He says: "The theory as to how bird waves are formed is that species keep moving northward until they come to a low temperature barrier, where they stop. Several species and many individuals thus become concentrated just below the barrier. Then, when the barrier is lifted by a rise in temperature, they all move forward at the same time."

Cooke, in a well known passage, refers to the isotherm of 35 degrees as "the line of spring", and in speaking of the early Robins describes the sudden rise in temperature under the influence of the chinook winds, the rapid advance of this isothermal line resulting therefrom, and how the birds accelerate their speed to keep up with it. In this connection it is noteworthy that the temperature in that week of February, 1930, was 15 degrees above Cooke's line of spring.

That temperature may have a decisive effect upon birds during their migration is beyond dispute, and if such is the case it is difficult to see why it may not have an equal effect on them at the commencement of their northward flight. If not, just when would it start to function? Is there any reason to suppose that birds are more sensitive to heat or cold at the end of the first day's journey than at the start?

What we have been discussing is unseasonably warm weather in relation to the early migrants, since here the effect of temperature stands out in clearest relief. Later on, as warm days become the rule rather than the exception, and as physiological changes complete their cycle, the part that temperature plays in initiating migration will probably be less important, and will certainly be less easy to define. It is, however, one of the ever-present environmental factors that are an integral part of a bird's life. It must be borne in mind that wild birds in their winter home are normal, active individuals, continually

exposed to all their surroundings and responsive to them to a degree beyond our comprehension, in confirmation of which we need only point to the innumerable theories advanced by physicists in an effort to explain the ability of birds to find their way, theories that run all the way from terrestrial magnetism to specially sensitive membranes of the ear.

In the words of Lansborough Thompson, "One does not necessarily attach importance to the behavior of birds not wholly subject to natural conditions."

Madison, Wisc.

HIGHWAY CASUALTIES IN CENTRAL ILLINOIS DURING 1937

BY WILLIAM CHARLES STARRETT

Students of nature have long been aware of the disastrous rôle the automobile plays in destroying our wildlife; however, it has never been pointed out to what degree this destruction is carried throughout an entire year in a given area. Most of the literature on this subject is a summary of a trip across a number of states during one season. It is the purpose of the writer to show the amount of casualties through one year, 1937, in Central Illinois. No doubt the death rate due to automobiles fluctuates from one year to another, varying with the temperature, humidity, and precipitation (Dreyer, 1935). Also the rate will change due to animal cycles of abundance. According to Stoner (1936) the mortality varies among species in different localities. The writer was greatly impressed by this fact while making a tour through New York State and New England in 1933, by the great amount of skunks seen dead on the highways in comparison to Illinois. The following results may then be applied to Central Illinois, and used only as a comparison to other sections and regions of North America.

The focal point of this study was Peoria, Illinois, from which place 219 trips were taken for a total of 7,529 miles, averaging 34.56 miles per trip. The greatest distance from Peoria was eighty miles. Mileage and observations were kept only on well traveled highways in the country. Domesticated animals, such as poultry, dogs, and cats were omitted, confining the survey to wildlife only.

Central Illinois is located in the heart of the agricultural belt of the Middle West; consequently, most of the land is tilled, the chief crops being corn, wheat, and oats. This view is occasionally broken by an oak-hickory grove.

The mortality seems to be divided into five sections or seasons due to temperature, activity, and the appearance of certain species. The survey began the first of January, which was during the winter season. This season lasted through March 21, and began again November 15, lasting for the remainder of the year. The casualties of the two winter seasons were almost equal; .038 vertebrates for the first, and .040 for the second. The pre-spring season was inaugurated by the appearance of the woodchuck, which ended with the appearance of snakes, April 13. The spring season ended June 20, based on the great increase of animal activity along the highways. The summer season terminated August 31, with the increase of snake mortality. The pre-fall season lasted until October 12, with the decline of great animal activity. The fall season came to a close November 15, with the beginning of cold weather and snow.

For a complete summary of casualties see Tables I and II.

Mammals represented 24 per cent of the vertebrates killed, of which the cottontail rabbit composed 17 per cent and 70 per cent of the mammals. The rabbit, of all the vertebrates, is the only one whose mortality varies little through the seasons. If the results were plotted on a graph, the rabbit would appear in almost a straight line; whereas the other vertebrates would rise and fall in relation to seasons.

TABLE I. Vertebrate Casualties in Central Illinois, 1937.

NAME OF VERTEBRATE MAMMALS	WINTER (2067 miles)	PRE-SPRING (581 miles)	SPRING (1652 miles)	SUMMER (1296 miles)	PRE-FALL (868 miles)	FALL (418 miles)	WINTER (647 miles)	TOTAL FOR ENTIRE YEAR
Opossum	0	0	2	0	0	2	0	4
Common Mole	0	0	0	0	0	1	0	1
Common Skunk	0	0	0	1	1	1	0	3
Woodchuck	0	1	3	2	0	0	0	6
Striped Gopher	0	0	5	13	3	1	0	22
Gray Gopher	0	0	2	0	1	0	0	3
Fox Squirrel	0	0	3	2	5	0	0	10
Eastern Meadow Mouse	0	0	0	4	2	2	0	8
Norway Rat	0	0	0	2	2	1	1	6
Cottontail Rabbit	43	15	31	20	18	11	17	155
Unidentified	0	0	0	1	0	0	0	1
No. Mammals								219

BIRDS								
Hooded Merganser	0	1	0	0	0	0	0	1
American Rough-legged Hawk	1	0	0	0	0	0	0	1
Eastern Sparrow Hawk	1	0	0	0	1	0	1	3
Eastern Bob-white	1	0	0	1	0	0	0	2
Ring-necked Pheasant	0	0	1	0	0	0	0	1
Spotted Sandpiper	0	0	0	1	0	0	0	1
Eastern Mourning Dove	0	0	0	1	0	0	0	1
Northern Barred Owl	0	0	0	1	0	0	0	1
Northern Flicker	0	0	1	2	0	0	0	3
Red-headed Woodpecker	2	0	3	15	4	1	0	25
Yellow-bellied Sapsucker	0	0	0	0	1	0	0	1
Northern Downy Woodpecker	0	0	1	0	0	0	0	1
Eastern Kingbird	0	0	1	0	0	0	0	1
Northern Crested Flycatcher	0	0	0	1	0	0	0	1
Eastern Phoebe	0	0	0	1	0	0	0	1
Prairie Horned Lark	1	0	0	1	0	0	0	2
Barn Swallow	0	0	0	4	2	0	0	6
Rough-winged Swallow	0	0	0	1	4	0	0	5
Eastern Crow	1	0	0	0	0	1	1	3
Catbird	0	0	0	1	0	0	0	1
Brown Thrasher	0	0	2	3	0	0	0	5
Eastern Robin	0	1	11	8	3	0	0	23
Migrant Shrike	0	0	1	0	0	0	0	1
Starling	0	1	2	5	5	2	0	15
English Sparrow	28	2	53	244	113	30	5	475
Eastern Meadowlark	0	0	3	5	0	1	0	9
Eastern Red-winged Blackbird	0	0	0	2	0	0	0	2
Rusty Blackbird	0	0	0	0	1	0	0	1
Bronzed Grackle	0	0	0	2	1	0	0	3
Dickcissel	0	0	1	3	0	0	0	4
Towhee	0	0	0	1	0	0	0	1
Eastern Field Sparrow	0	0	0	1	0	0	0	1
Unidentified	0	0	0	5	0	0	1	6
No. Birds								607
REPTILES								
Bull Snake	0	0	17	4	13	1	0	35
Garter Snake	0	0	1	3	8	1	0	13
Coluber sp.	0	0	1	2	9	0	0	12
Chrysemys sp.	0	0	0	2	1	0	0	3
Chelydra sp.	0	0	1	0	0	0	0	1
No. Reptiles								64
AMPHIBIANS								
Rana sp.	0	0	0	1	0	0	0	1
Bufo sp.	0	0	0	1	0	0	0	1
No. Amphibians								2
Total Numbers	78	21	146	367	198	56	26	892

Birds were the most frequent dead vertebrates, composing 68 per cent of the fatalities. The English Sparrow represented 53 per cent of all the vertebrates, and 78 per cent of the birds. Eighty-eight per cent of the bird mortality occurred during the warmer seasons (April 13 through October 12). The Red-headed Woodpecker made up 2.8 per cent of all mortality and 4 per cent of the birds. In central Illinois the Red-headed Woodpecker is a permanent resident; however

only two were found killed by cars during the winter months. This is due to their habit of being a roadside bird only through the warmer months, and spending the remainder of the year in the white oak-hickory woods.

Reptile mortality was highest during the spring and pre-fall seasons. The logical explanation for this seems to be that the highways were the warmest places the snakes could find. The reptiles represented 7 per cent of all vertebrate fatalities, out of which the bull snake made up 3.9 per cent and 58 per cent of the snakes. Turtle casualties would have been found higher had more trips been taken in the region of lakes, rivers, and sand dunes.

A total of 174 game animals were noted, this group made up 19 per cent of the mortality. The rabbit represented 89 per cent of the game animals. Beneficial and game animals combined were 43 per cent of all mortality. The remaining 57 per cent were non-beneficial animals, chiefly English Sparrows.

TABLE II. Amount of Mortality per Mile.

	Winter	Pre-Spring	Spring	Summer	Pre-Fall	Fall	Winter	Average for Year
All vertebrates	.038	.036	.088	.283	.228	.134	.040	.118
Mammals	.021	.028	.028	.035	.037	.045	.028	.029
Cottontail	.021	.026	.019	.015	.021	.026	.026	.021
Birds	.016	.009	.048	.238	.156	.084	.011	.080
Reptiles	.000	.000	.012	.008	.036	.005	.000	.009
Amphibia	.000	.000	.000	.002	.000	.000	.000	.0002

Stoner (1936) tabulated results from several surveys on highway casualties over the eastern part of North America during the warmer months, and found an average of .153 dead vertebrates per mile, including domesticated animals. An average of .186 was found by the writer in central Illinois over the same period and included only wildlife. Excluding domesticated animals from Stoner's (1936) trip across Illinois, .207 vertebrates per mile were noted; .228 per mile was found by the present writer in 1937 during the same season.

The average over the entire year was .118 dead vertebrates per mile or a casualty every 8.47 miles.

From the writer's experience the killing of birds by an automobile seems to be unavoidable in most instances; however, the mortality in mammals and reptiles could be lowered if drivers were educated to avoid them.

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PEORIA, ILLINOIS.

A UNIQUE POPULATION OF WATER BIRDS IN NORTHERN OHIO—1937

BY LAWRENCE E. HICKS

Southwest of Sandusky, Ohio, and a dozen miles due south from Sandusky Bay, Lake Erie, is located the little city of Bellevue. The inhabitants boast of Bellevue as "the city without any sewers". The explanation of this anomaly is concerned with the development of a most remarkable population of water birds in the Bellevue area during the summer of 1937.

The background is one of geology. Bellevue rests on a formation of Devonian limestone. A belt averaging twelve miles in width outcrops from the Lake Erie shore southwards for nearly fifty miles. This corniferous limestone is extremely soluble, so that surface waters enlarge every crack they penetrate and sink in, forming elaborate connected systems of underground channels. Sinkhole topography is general, with little or no development of surface drainage systems.

Surface waters from as far south as the divide between the Ohio-Lake Erie drainage systems pass northward through these underground channels past Bellevue to Sandusky Bay, emerging as mammoth artesian springs at Miller's Pond, Green Spring, and Castalia. The largest of the several Blue Holes at Castalia delivers 5,000 gallons of water a minute. Holes punched in this rock formation enable rural landowners to solve all farm drainage problems and city dwellers to dispose of sewage wastes.

On about six occasions since 1800 this convenient arrangement has "backfired". The last eruption, late in June, 1937, was by far the most serious and extensive. Cloudbursts on June 21 were followed by heavy rain which began on June 24 and resulted in 7.84 inches of precipitation in the Bellevue area and nearly as much in most of north central and northwestern Ohio. At Bucyrus the total precipitation for June (mostly in the last week) was 14.81 inches. Soon a waterhead of more than eighteen feet developed. Local flood waters were augmented by the thousands of active artesian springs that developed over night. In single fields were several hundred little fountains from as many springs. In one area of less than an acre the writer counted 134 springs, including a number of large size. With no surface drainage, every sinkhole basin became a large lake. This grew until it spilled over the divide and created a dashing torrent which spiraled around the countryside spreading destruction on every hand. The law of gravity seemed to have been "repealed", with flood waters

bursting from hill tops and crossing ridges that would be immune except in a topsy-turvy flood.

In Bellevue geysers spouted from dooryards or lifted masses of pavement from the streets. Some 160 houses were inundated. All highways in the region were impassable for many days. Several that crossed sinkhole basins were blocked by water for more than two months. Some farmers were forced to use boats for weeks to reach their homes. Many trees died because the water suffocated the roots. Basements refilled with subterranean water as rapidly as it was pumped out. The original flood conditions redeveloped twice during the first two weeks because of subsequent cloudbursts.

For three weeks after the floods began, transportation difficulties made it nearly impossible to check on most of the water areas to determine the number of water birds attracted. By July 15, the twenty-five square miles estimated to have been covered by flood waters in the Bellevue area at one time had dwindled to about 1,500 acres of land-locked ponds which slowly decreased in size.

My record of the rise and fall of the water bird population of this area is supplemented by the observations of Louis W. Campbell, of Toledo; Dr. John W. Aldrich and F. W. Braund, of the Cleveland Museum of Natural History; Gene Rea, of Columbus; and Edward S. Thomas, of the Ohio State Museum.

These thirty-five ponds were located as follows: Twenty-one were north of Bellevue (see Bellevue Quadrangle of the U. S. Geological Survey), ten being in Sandusky County (all in York Township), and eleven in Erie County (all in Groton Township). Fourteen were southwest of Bellevue (see Siam Quadrangle), in Seneca County (Thompson Township, 12; Adams Township, 1; and Scipio Township, 1).

These ponds were not large in total acreage, but were ideal in distribution and nature to support large summer populations of water birds. Their shore line length was great. Many low islands were included. The waters were shallow and teeming with stranded fish. Conditions were such that immense numbers of aquatic insects and other small water animals developed. Flooded wheat fields were most attractive to ducks and grebes. The grain was ripe but uncut, remaining erect throughout the summer, providing ideal food and cover. Fields originally in corn and potatoes became ideal mud flats as the waters slowly retreated, exposing new areas for shore birds each week. Some species of shore birds were most attracted to the hillsides high above the ponds where the spring waters spread out in broad, alluvial fans.

The thirty-five ponds totaled 1,210 acres on July 15, 693 acres on August 1, 432 acres on August 15, 208 acres on September 1, and 128 acres on September 23. Fall rains stopped the shrinkage of many ponds so that a number of small pools totaling 100 acres remained as late as November 1.

The drop in water level was nearly synchronized in the different ponds, but the larger, deeper ones lasted longer. As the harvest of fish and other water animals at one pond was completed with its disappearance, the water birds present moved on to adjacent ponds. It is thought, however, that the maximum populations recorded for each pond, when totaled, will about equal but not much exceed the total population present. The largest count for each of the thirty-five ponds, when totaled, gives the maximum summer population for the area as 5,170 ducks, 4,900 shore birds, and 1,134 herons. The height in numbers varied for each species but came earliest for shore birds (August 5 to 20), next for herons (August 25 to September 10), and latest for ducks (September 5 to September 25).

Reasonably accurate counts were made at the majority of the important ponds on each of fifteen dates: two counts in July, five in August, five in September, and three in October. Permanent records of several of the rarer species were made by collection. In all, eight species of herons and bitterns, thirteen species of ducks, twenty-seven species of shore birds, and eighteen species of other water birds, or a total of sixty-six aquatic species, were recorded.

The heron population was augmented from large colonies of the Great Blue Herons and Black-crowned Night Herons in the general region, and a heavy influx of "white herons" from the south. The duck population, before early September, probably was drawn from Ohio breeding ducks of the nearby Lake Erie marshes of Lucas, Ottawa, Sandusky, and Erie Counties. Elsewhere in Ohio in 1937, the unusually high level of Lake Erie, reservoirs, and streams made few sites attractive to shore birds. My own observations, supplemented by those of various ornithologists of the State, make it possible to list for comparison the approximate 1937 maximum shore bird populations (July to September) at each of the principal shore bird areas of the State:

Sandusky area	800	Youngstown region	800
Lower Maumee River	700	Buckeye Lake	75
Lucas—Ottawa marshes	500	Indian Lake	50
Painesville—Ashtabula area	300	Grand Reservoir	125
Pymatuning Lake	250	Portsmouth area	120

Thus it seems highly probable that the unusual events in the Bellevue area in the summer of 1937 attracted a shore bird population

approximately equal to that of the remainder of Ohio. In the following lists the name of each species is preceded by two numbers; the first represents the number of trips (out of the fifteen recorded) on which that species was noted, and the second represents the total number of individuals counted (or in some cases estimated) on all trips combined. Many individuals, of course, were recounted on several of the weekly counts, but the total number enumerated, together with the number of trips on which recorded, gives a good index to the relative numbers present. The species in each group are listed in the order of abundance. Those of rare occurrence in northern Ohio are starred. The vernacular names used follow the 1931 A. O. U. Check-List.

A. Shore Birds—Twenty-seven species.

14—1,398	Pectoral Sandpiper	6—23	Black-bellied Plover
13—1,238	Semi-palmated Sandpiper	5—20	Western Sandpiper
12—1,177	Least Sandpiper	3—20	Sanderling
14—1,100	Lesser Yellow-legs	1— 6	*Long-billed Dowitcher
13— 922	Killdeer	2— 4	White-rumped Sandpiper
13— 530	Semi-palmated Plover	2— 2	Ruddy Turnstone
15— 248	Wilson Snipe	2— 3	American Woodcock
11— 222	Greater Yellow-legs	2— 3	*American Knot
13— 125	Spotted Sandpiper	1— 2	*Buff-breasted Sandpiper
7— 103	Eastern Dowitcher	1— 1	Piping Plover
8— 98	Stilt Sandpiper	1— 1	Golden Plover
11— 82	Solitary Sandpiper	1— 1	*Hudsonian Godwit
3— 54	Red-backed Sandpiper	1— 1	*Northern Phalarope
6— 32	Baird's Sandpiper		

B. Ducks—Thirteen species.

15—5,846	Common Black Duck	2—26	Redhead
15—3,844	Common Mallard	2—18	Lesser Scaup Duck
7— 872	Blue-winged Teal	6—16	Shoveller
4— 137	Baldpate	3—16	Gadwall
5— 78	American Pintail	1— 6	Ruddy Duck
5— 36	Green-winged Teal	3— 3	Canvas-back
7— 27	Wood Duck		

C. Herons and Bitterns—Eight species.

11—549	Black-crowned Night Heron	9—61	Little Blue Heron
15—446	Great Blue Heron	10—29	American Bittern
13—308	American Egret	2— 3	Eastern Least Bittern
12—286	Eastern Green Heron	1— 1	*Snowy Egret

D. Other Aquatic Birds—Eighteen species.

6—26,700	Bank Swallow	3—3	Herring Gull
14— 148	Pied-billed Grebe	3—3	Duck Hawk
9— 92	American Coot	2—3	King Rail
13— 61	Eastern Belted Kingfisher	2—3	Sora
15— 46	Marsh Hawk	2—2	Osprey
6— 13	Florida Gallinule	2—2	Caspian Tern
5— 21	Ring-billed Gull	1—2	Common Tern
4— 6	Virginia Rail	1—2	Bonaparte's Gull
3— 5	Black Tern	1—1	*Forster's Tern

OHIO STATE UNIVERSITY,
COLUMBUS, OHIO.

EDITORIAL

At the Meeting in Ann Arbor in 1928 the question of a W. O. C. library was presented. At the Des Moines Meeting in 1929 the report of the Committee shows that two institutions had indicated a willingness to accept the library on terms agreeable to the Club. These institutions were the University of Michigan and the Iowa State College. The report of the Library Committee and the text of the Agreement with the University of Michigan were printed in the Wilson Bulletin for March, 1931. This report includes the following paragraph: "The original plan includes the establishment of one or two additional libraries of a similar, though possibly less technical, nature; one to be located somewhere in the south, and another, perhaps, west of the Mississippi River. Preliminary steps have been taken looking toward these additional libraries, but it was the Commitee's policy to secure the culmination of the first one before taking active steps toward others."

As a member of the first Library Committee the present writer may state that it was the Committee's intention to proceed with the establishment of the other libraries as soon as suitable locations could be found. At the time the original committee was functioning the Iowa State College had agreed to accept the establishment of a library on the same terms agreed to by the University of Michigan. The Iowa State College has a beautiful new stone library building which is fireproof and provided with ample space. Ornithological research is being carried on as actively here, perhaps, as anywhere in the middle west. There are arguments in favor of concentrating our support on the existing library at Ann Arbor. But a good case may also be made for getting under way whatever additional libraries may be considered feasible. The conclusion is that it may be wise for the Club to again take up the consideration of a library west of the Mississippi River. The writer has been informed that the proposal from the Iowa State College is still open.

GENERAL NOTES

Conducted by O. A. Stevens

The Golden Eagle Again Noted in Ohio.—Mr. Roy Hamilton, of near Kenton, Ohio, set a trap for a bird that had attacked one of his sheep. Although the bird had picked out both its eyes and had made a large hole in its side, the sheep still lived. On February 3, 1938, the bird was caught and found to be a Golden Eagle (*Aquila chrysaëtos canadensis*). When caught the eagle raised and flew fifty-two feet carrying a piece of wood weighing over twenty pounds. It had a wing spread of six feet. A pair had been seen for several days before the capture; but the mate disappeared. Mr. Hamilton says that twelve years ago a pair of these eagles were observed in the same neighborhood.—Katie M. Roads, *Hillsboro, Ohio.*

Red-throated Loon and Herring Gull in Western Pennsylvania.—At Linesville Lake, Pennsylvania (the sanctuary adjoining Pymatuning Lake on the Pennsylvania-Ohio line), the writer saw a Red-throated Loon (*Gavia stellata*) on April 20, 1938. The bird was in winter plumage but a trace of red was noticed at the sides of the throat. Observations were made with a 35x telescope at 150 yards or less and in good light. At one time a Common Loon passed less than six feet from the Red-throated Loon. Mr. A. B. Fuller, of the Cleveland Museum of Natural History, saw a Red-throated Loon at the same place on April 10. In ten years of observing water birds, the above is my first record for this species.

On January 3, 1938, I saw an adult Herring Gull feeding in an open field about two miles west of Youngsville, Pennsylvania. The region is quite hilly and several miles from any lake or stream. In this location the bird seemed strangely out of place.—M. B. Skaggs, *South Euclid, Ohio.*

Barrow's Golden-eye: A Correction.—In the June, 1923, number of the Wilson Bulletin, Vol. XXXV, p. 116, I reported the occurrence of Barrow's Golden-eye at Buckeye Lake, Ohio. For many years I have been satisfied that the identification was obviously erroneous, the individual in question having been an immature male American Golden-eye. In this conclusion Milton B. Trautman and F. Dale Pontius, who also observed the bird, are in entire agreement with me. I have seen a number of young male American Golden-eyes in a similar plumage, superficially resembling that of the adult male Barrow's. In such specimens the white of the scapulars is much reduced and the white spot before the eye partially concealed, so that it may be higher than wide. In addition, the mixture of purplish-brown and iridescent black feathers on the head gives a purplish cast in certain lights. This, however, does not approach the brilliant violet sheen of the head of the adult male Barrow's, nor does the white mark extend across the entire base of the bill as in the latter species.—Edward S. Thomas, *Ohio State Museum, Columbus, Ohio.*

Breeding of the Mockingbird in Northwestern Iowa.—In Philip A. DuMont's book, "A Revised List of the Birds of Iowa", the Eastern Mockingbird (*Mimus polyglottos polyglottos*) is listed among those species of birds considered as typical Carolinian indicators in the past, but which have recently advanced so far north that they may now hardly be considered as true guides to the northern limits of the zone. Anderson's "Birds of Iowa" (1907) reports a pair as nesting

in Sioux County, Iowa. During the summer of 1911 or 1912, a pair is reported by Bennett to have nested in Woodbury County, Iowa.

On July 21, 1938, Mrs. W. C. DeLong of Sergeant Bluff, Iowa, reported to me that a pair of mockingbirds were nesting on the farm of George Mathers in Liberty Township, Woodbury County, Iowa. I visited the place the next day and found the nest. The nest was built in a vine on the front porch, about six feet from the ground. There were four young in the nest, and I judged them to be less than a week old. Both adult birds were seen. Mr. Mathers' father told me that another pair of adult birds had been there that day and he had seen all four birds at one time. I saw only the one pair.—BRUCE F. STILES, *Sioux City, Iowa.*

How Do Crows Carry Eggs?—On May 2, 1938, while working on the E. H. Fabrice Wildlife Demonstration Area in southeastern Wisconsin, it was my good fortune to see a Crow carrying an egg which I judged to be that of a semi-wild Mallard. The Crow had first pierced the egg with both mandibles closed when it discovered my presence and jumped back from the egg. It immediately returned and placed the upper mandible into the opening made in the egg, and then by lowering its head, scooped up thte egg. It flew apparently supporting the egg on the lower mandible and keeping it there by means of pressure from the upper mandible. After flying a distance of 100 yards the Crow came down in an opening in the woods. I ran after it hoping to get the egg, but it took off again, repeating a second time the operation of placing the upper mandible into the opening in the egg and rolling the egg onto the lower mandible by a scooping movement of the head. This time the Crow flew far into the woods and I lost track of it. I should greatly appreciate correspondence from any one of the readers who have witnessed Crows carrying eggs or who know of any references on this subject in the literature.—DOUGLAS E. WADE, *University of Wisconsin, Madison, Wis.*

An Unusual Nesting Site of the Rough-winged Swallow.—Ordinarily the Rough-winged Swallow (*Stelgidopteryx ruficollis serripennis*) selects stream banks, quarry faces or crevices in rocky cliffs for nesting sites. I was much surprised to find, on May 6, 1938, two pairs nesting in the iron over-flow pipes of a swimming pool. This was located at Boy Scout Camp Oyo on the Roosevelt Game Preserve, Scioto County, Ohio. At the time of discovvery the pool contained no water. The over-flow pipes, two in number, were set about four inches apart and flush with the vertical face of the concrete wall. The pipes were about three inches in diameter. The nests were placed eight inches within the pipes and could readily be seen from the openings. The swallows made repeated trips to and from the nests while under observation. This suggests a technique which wildlife managers might utilize. In localities where the natural nesting sites have been walled up with stone by stream "canalization" relief projects, valuable mosquito-consuming swallows might be encouraged by setting short lengths of iron pipe into the stone walls for use as nesting places.—FLOYD B. CHAPMAN, *Ohio State University, Columbus, Ohio.*

Audubon's Shearwater Nesting on Mona Island, Puerto Rico.—In March, 1937, Leslie Holdridge, of the United States Forestry Service in Puerto Rico, told me of a colony of birds in a cave on Mona Island in a part of the island which I had never visited. His description of the bird led me to believe that it was Audubon's Shearwater (*Puffinus lherminieri*), though that bird had

not to my knowledge been found breeding in the Greater Antilles, nor had it been observed to breed in caves. Mr. Holdridge described the cave as halfway down a cliff, accessible only by means of a rope. He reported no birds flying about outside, but the floor of the cave was lined with nests so close together that it was difficult to step between them, and that the birds were fluttering about by the hundreds inside the cave. My first opportunity to revisit Mona Island after this report was in October, 1937, when through the courtesy of Mr. E. W. Hadley, Forest Supervisor, I was included in a party inspecting some work of the Forestry Service on this island. I availed myself of this opportunity and took a guide to the cave. I did not expect to find the birds nesting at that season of the year, but hoped to find enough feathers, bones, and eggshells to prove the identity of the species. My guide, one of the few residents of the island, pointed out to me the slight concavities used as nesting burrows. They were indeed all over the floor of the cave, some in total darkness, some in the dim light from the mouth of the cave. I gathered some feathers and eggshells from the more protected nests under rocks and ledges, and finally found a dead bird with skull entire and many of the feathers in good condition. Then, as I passed farther into the cave, a bird scuttled off among the rocks. We captured this and another individual, the only two seen, and were able to establish the identity as Audubon's Shearwater. This is, to the best of my knowledge, the first breeding record of this bird in the Greater Antilles, and a rather unusual nesting habitat, for this shearwater usually makes its own burrows in the earth. No attempt was made to count the number of nests, though my guide, who has used this colony as a source of eggs for many years, said there were thousands. The egg season is reported as being in January and February.—J. Adger Smyth, *Puno, Peru.*

Shore Birds Attracted to Streams Polluted by Sewage.—Year after year my best locality for observing shorebirds was along a branch of the Portage River thirty or forty rods below where a ditch enters it. This open ditch, three miles long, carried the sewage from the city of Bowling Green. After years of discussion and investigation a sewage disposal plant was constructed. It began operating in 1935. Since that I have found very few shorebirds along this part of the stream, where formerly I often found between twenty and forty.

In order of abundance they were Lesser Yellow-legs, Killdeer, Pectoral, Semipalmated, Solitary, Least, and Spotted Sandpipers, Greater Yellow-legs, Baird's Sandpiper, Semipalmated Plover, Sanderling, and Stilt Sandpiper. After rearing their young in Canada or Michigan, may of these birds return to northern Ohio late in July or early in August.

The part of the stream where the greatest number were observed is close to an important highway, so that they were not attracted to it because of its affording seclusion. It has some sharp bends and shallow water with many partly emerged stones, and some mud flats and sandy beaches.

One of my former students who knows the birds told me that in Norwalk, Ohio, he used to see shorebirds along the creek below where sewage from a portion of the city entered, and nowhere else in Norwalk. Since the disposal plant has been in operation, about four years, he has not seen shorebirds there. Below a dam on the Sandusky River in Tiffin, Ohio, October 3, 1936, I saw more than fifty shorebirds, a majority of them yellow-legs and Pectoral Sandpipers. I think their food was derived from sewage. Below another dam some twenty miles

farther south in the same stream I spent considerable time the next day looking for shorebirds but saw none. This was not near any town. These birds have often been seen in large numbers along the Portage River where it runs through the village of Elmore and along the Maumee River in Antwerp, which is not far from the Ohio-Indiana line.

Microörganisms of several kinds thrive in sewage. They are fed upon by other tiny creatures, and these in turn by those still larger. After a number of such transformations the material probably becomes a part of the molluscs, crustacea, and aquatic insects that are attractive to birds.—E. L. Moseley, *Bowling Green, Ohio.*

A Note on Highway Mortality.—While driving from Princeton, New Jersey, to Flagstaff, Arizona, on June 8-14, 1938, the writers made a count of bird mortality on the highways. Our results may be thus summarized:

Native birds (50 species)	268	48.90%
English Sparrow (*Passer domesticus*)	235	42.88
Chicken (*Gallus gallus*) and Pigeon (*Columba livia*)	19	3.47
Starling (*Sturnus vulgaris*) and Pheasant (*Phasianus colchicus*)	3	.55
Unidentified birds	23	4.20
Total	548	100.00%

Our route was through southern Pennsylvania to Washington, Pa., then on U. S. Route 40 to St. Louis and U. S. Route 66 from there to Flagstaff. After subtracting night driving, a count of dead birds was made over 2,195 miles, of which 867 were east and 1,328 west of the Mississippi River. Over this distance we found an average of one bird every 2.68 miles east, and one every 5.93 miles west of the river, or an average of one bird per four miles for the trip. English Sparrows were divided 164 east to 71 west, and native birds 133 east to 135 west of the Mississippi.

The number of birds found over considerable distances west of the river was undoubtedly much reduced by heavy rains and wind. In Arizona, where favorable conditions for counting obtained, 29 native birds (7 species) were counted in 155 miles, contrasting with 28 native birds (9 species) from the 210 miles driven in Ohio. Such comparisons, of course, are significant, if at all, only for species frequently killed by automobiles.

The following native birds were detected in greatest numbers: Lark (*Otocoris alpestris*), 32 (23 in Texas); Grackle (*Quiscalus quiscula*) 32; Robin (*Turdus migratorius*), 28; Nighthawk (*Chordeiles minor*), 20 (14 in Arizona); Shrike (*Lanius ludovicianus*), 15 (12 in New Mexico and Arizona); Meadowlark, two species, probably, (*Sturnella*), 13; Brown Thrasher (*Toxostoma rufum*), 11; Screech Owl (*Otus asio*), 11; Mourning Dove (*Zenaidura carolinenses*), 10.

Although automobiles may occasionally strike almost any species of bird, we were surprised to find the following victims: Wood Duck (*Aix sponsa*), adult ♀ near Hazelgrove, Missouri; Chimney Swift (*Chaetura pelagica*), one at Edmond, Oklahoma; White-throated Swift (*Aeronautes s. saxatalis*), one west of Grant, New Mexico. An Eastern Kingbird (*Tyrannus tyrannus*) picked up June 14 twenty miles west of Holbrook, Navajo County, is apparently the first Arizona specimen of this bird (by four days!). The skin is in the collection of the Museum of Northern Arizona at Flagstaff.

Remarks. Most birds killed by automobiles are, as would be expected, of common, widely distributed species. In regions of heavy automobile density, however, it seems likely that appreciable decreases in the local population of a few vulnerable species, such as the Screech Owl, may result from highway mortality.

Dr. J. M. Linsdale (*Condor*, 1929, pp. 143-145) and others have emphasized the important and complex influence of roads upon birds. Although the benefits to bird-life are frequently more important than the toll taken by automobiles, every effort should be made to reduce this heavy and ever-increasing destruction. With the exception of a few areas having a heavy population of soil-loving species such as the Nighthawk and Horned Lark, the writers found it evident that along highways where roadside vegetation was scanty or had been removed, the number of dead birds was always low. For this reason we believe that on highways where traffic is continuous and rapid, such activities as tend to discourage immediate roadside concentrations of birds, and to make approaching vehicles more visible, should be encouraged by conservationists. The maintenance of a strip of gravel two or three yards wide on each side of the pavement is one such measure that seems to be particularly effective.—Henry N. Russell, Jr., *Princeton, New Jersey*, and Dean Amadon, *American Museum of Natural History, New York, N. Y.*

Carrier Pigeon with Blue-winged Teal.—For a number of years The Duck Island Club has maintained a very complete record of the kill of waterfowl on its preserve along the Illinois River between Pekin and Havana. There are a number of interesting marginal notes in its record books, of which the following seems to show another curious fate of Carrier Pigeons which do not return to their cotes.

> October 5th Wednesday 1921 at the hour of about 2:30 PM D. W. Voorhees Sr of Peoria Ills. was shooting ducks from a blind in the upriver end of Pond Lilly Lake when he Mr. Voorhees & his guide Clark Fuller of Banner, Ills. sighted what was as they suppose 4 blue winged teal approaching high up *from the north* over the big timber. As the 4 birds came nearer all flying in a line, we discovered the 3rd bird from the front was different from the other 3. Mr. Voorhees shot the front teal duck & dropped back & killed the 3rd bird. On Clark Fuller's picking up the 2 birds it was discovered that the 2nd bird killed was a large male *carrier pigeon.* On the pigeon's right leg standing behind it is an *aluminum* band bearing the stamp (viz.) AJ21E7523. On the left leg was a *brass band* on which (inside) is the number 4553. Its crop was very plentifully filled with "soy beans". The pigeon was heavy and apparently well nourished. Opinion only: the pigeon had been started on a home flight became lost & taken up companionship with the 3 blue winged teal. We examined the crop of the blue winged teal killed while in company with the carrier pigeon & found the teal's crop contained the same kind of "soy beans" as that contained in the pigeon's crop. We expect to advertise the above numbers in the sporting paper & try & locate the owner.
>
> Signed D. W. Voorhees
> Clark Fuller
> 10/5/21
>
> Mr. Voorhees has in his possession the legs & bands described & will gladly exhibit them to anyone interested: the feed being the same in the teal's and pigeon's crop shows conclusively they had been feeding together.

—Ralph E. Yeatter and David H. Thompson, *Illinois Natural History Survey, Urbana, Ill.*

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MEMBERSHIP ROLL OF THE WILSON ORNITHOLOGICAL CLUB†

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Bretsch, Clarence, 690 Broadway, Gary, Indiana 1925
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Rogers, Charles Henry, Princeton Museum of Zoology, Princeton, N. J. 1903
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Taylor, Dr. Arthur Chandler, Washburn, Wisconsin 1929
Taylor, Mrs. Rose Schuster, 900 Santa Barbara Rd., Berkeley, California 1916
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†This membership roll is complete to June 1, 1938. The Secretary would appreciate immediate notification of any omission of names and change in address, or any errors in the spelling of names, the use of titles, and the exact years of election to membership. The Secretary would also appreciate having the *full* names of all members.

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Bishop, Dr. Louis Bennett, 450 Brandford St., Pasadena, California....1903
Brand, Albert Rich, 9 E. Av., Ithaca, New York....1931
Bruen, Frank, 22 High St., Apt. A-4, Bristol, Connecticut....1902
Cahn, Dr. Alvin Robert, Forestry Bldg., Norris, Tennessee....1914
Chambers, Willie Lee, 2068 Escarpa Dr., Eagle Rock, Los Angeles ,California..1934
Christopher, Mrs. Joseph, Fairhope, Alabama (May 30-Oct. 30) Hingham, Massachusetts....1937
Coursen, Charles Blair, 761 E. 69th Pl., Chicago, Illinois....1927
Fargo, William Gilbert, 506 Union St., Jackson, Michigan....1923
Frost, Mrs. Charles Sumner, 880 Elm Tree Rd., Lake Forest, Illinois....1937
Ganier, Albert Franklin, 2507 Ashwood Av., Nashville, Tennessee....1915
Goetz, Christian John, 3503 Middleton Av., Cicninnati, Ohio....1930
Harper, H. F., Motor Wheel Corporation, Lansing, Michigan....1938
Harriot, Samuel Carman, 200 W. 58th St., New York, New York....1934
Harris, Dr. Arthur Travenning, 700 Van Buren St., Gary, Indiana....1930
Havemeyer, Henry Osborne, Mahwah, New Jersey....1930
Helmuth, Dr. William Todd, 667 Madison Av., New York, New York....1934
Howell, Arthur Holmes, 2919 S. Dakota Av., Washington, D. C....1921
Magee, Michael Jarden, 603 South St., Sault Ste. Marie, Michigan....1919
Mitchell, Dr. Walton Iungerich, 1644 Visalia Av., Berkeley, California....1893
Myrland, Arthur Lucius, Magdalena, New Mexico....1938
Nelson, Miss Theodora, 2695 Heath Av., New York, New York....1928
Philipp, Philip Barnard, 172 East 64th St., New York, New York....1914
Procter, William, 430 Park Av., New York, New York....1937
Roads, Miss Katie Myra, 463 Vine St., Hillsboro, Ohio....1914
Roberts, Dr. Thomas Sadler, Museum of Natural History, University of Minnesota, Minneapolis, Minnesota....1914
Shearer, Dr. Amon Robert, Mount Belvieu, Chambers Co., Texas....1893
Stephens, Dr. Thomas Calderwood, Morningside College, Sioux City, Iowa....1911
Stoddard, Dr. Herbert Lee, Route 5, Sherwood Plantation, Thomasville, Ga....1916
Strickland, J[ud] Warren, Jr., 703 5th Av., Mt. Vernon, Iowa....1938
Sutton, Dr. George Miksch, Bethany, West Virginia....1920
Swenk, Myron Harmon, 1410 N. 37th St., Lincoln, Nebraska....1914
Todd, Walter Edmond Clyde, Carnegie Museum, Pittsburgh, Pennsylvania....1911
Toppin, Mrs. Isabel Whitehouse, 1420 Harvard Blvd., Toledo, Ohio....1938
Toppin, James, 1420 Harvard Blvd., Toledo, Ohio....1938
Uhrig, Mrs. A. B., 425 E. Water St., Oconomowoc, Wisconsin....1926
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Young, Col. John Paul, 205 Devon Rd., Ithaca, New York....1913

Active Members

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Adams, Benjamin, 25 Garden St., Wethersfield, Connecticut....1936
Aldrich, Dr. John Warren, Cleveland Museum of Natural History, Cleveland, Ohio....1930
Allen, Dr. Arthur Augustus, Fernow Hall, Cornell University, Ithaca, N. Y....1914
Allen, Durward Leon, Swan Creek Wildlife Experiment Station, Allegan, Michigan....1933
Bailey, Alfred Marshall, Colorado Museum of Natural History, Denver, Colo...1928
Bartel, Karl [Emil] Edgar, 2528 W. Collins So., Blue Island, Illinois....1934
Bartlett, Wesley Hamilton, Parsons College, Fairfield, Iowa....1936
Bartsch, Dr. Paul, U. S. National Museum, Washington, D. C....1894
Bennett, Carey Hall, 1565 Locust St., Denver, Colorado....1937
Bennett, Miss Mary Allison, 623 E. Carroll St., Macomb, Illinois, or 5559 Unio Av., Chicago, Illinois....1933
Bennett, Walter Waldo, Arnolds Park, Iowa....1925

Bennitt, Dr. Rudolf, Department of Zoology, University of Missouri, Columbia, Missouri 1932
Bent, Arthur Cleveland, 140 High St., Taunton, Massachusetts 1893
Blain, Dr. Alexander Willis, 2201 Jefferson Ave., E., Detroit, Michigan 1902
Blake, Mrs. Charles Henry, Massachusetts Institute of Technology, Cambridge, Massachusetts 1935
Blincoe, Benedict Joseph, Route 1, Dayton, Ohio 1920
Bole, Benjamin Patterson, Jr., 2717 Euclid Av., Cleveland, Ohio 1938
Brant, Irving, 630 F. St., N. E., Washington, D. C. 1932
Breckenridge, Walter John, Museum of Natural History, University of Minnesota, Minneapolis, Minnesota 1929
Brockner, Winston William, 175 Dutton Av., Buffalo, New York 1933
Brodkorb, Dr. William Pierce, Museum of Zoology, Ann Arbor, Michigan 1936
Brooks, Major Allan Cyril, Okanagan Landing, British Columbia, Canada 1930
Brooks, Earle Amos, 166 Plymouth Rd., Newton Highlands, Massachusetts 1933
Brooks, Maurice [Graham], Department of Zoology, University of West Virginia, Morgantown, West Virginia 1934
Bryens, Oscar McKinley, McMillan, Luce Co., Michigan 1924
Buckelew, Herbert, 611 E. 2nd St., Milford, Delaware 1936
Burdick, Dr. Harold C., Box 164, Milton, Wisconsin 1929
Burleigh, Thomas Dearborn, Oakhurst Route, Gulfport, Mississippi 1922
Burtch, Verdi, Branchport, New York 1924
Cahalane, Victor Harrison, Wild Life Division, National Park Service, Washington, D. C. 1933
Carpenter, F. S., 2402 Longest Av., Louisville, Kentucky 1934
Chapman, Dr. Frank Michler, American Museum of Natural History, 77th St. and C. P. W., New York, New York 1910
Chase, Henry B., Jr., Southern Biological Supply Co., New Orleans, La. 1932
Christy, Bayard Henderson, 403 Frederick Av., Sewickley, Pennsylvania 1922
Clay, Miss Marcia Barnes, Bristolville, Ohio 1924
Coffey, Ben Barry, Jr., Inspection Bureau, 1434 Bank of Commerce Bldg., Memphis, Tennessee 1927
Cole, Dr. Leon Jacob, Genetics Bldg., University of Wisconsin, Madison, Wisconsin 1921
Cook, Miss Fannye Addine, State Game and Fish Commission, Jackson, Miss. 1925
Cottam, Dr. Clarence, U. S. Department of Agriculture, Biological Survey, Washington, D. C. 1929
Cox, William Thomas, Regional Forester, U. S. Resettlement Administration, 6th Floor Court House, Milwaukee, Wisconsin 1936
Danforth, Dr. Stuart Taylor, Box 541, Mayaguez, Porto Rico 1924
Deaderick, Dr. William Heiskell, 36 Circle Dr., Hot Springs, Arkansas 1936
DeLury, Dr. Ralph Emerson, Dominion Observatory, Ottawa, Ontario, Canada 1920
Dickinson, Francis Reynolds, 1518 Astor St., Chicago, Illinois 1931
Dodge, Thomas Henry, Box 69, Gallup, New Mexico 1933
Dodge, Victor Kenney, 137 Bell Court, W., Lexington, Kentucky 1935
Douglass, Donald Wickmore, Department of Biology, Texas Technological College, Lubbock, Texas 1929
DuMont, Philip Atkinson, Sand Lake Waterfowl Refuge, Columbia, So. Dak. 1928
Duncan, Donald Pendleton, 5841 Nickeroon Av., Norwood Park, Chicago, Ill. 1936
Eifrig, Prof. Charles William Gustave, 1029 Monroe Av., River Forest, Ill. 1907
Ekblaw, Dr. George Elbert, 506 W. Main St., Urbana, Illinois 1914
Ekblaw, Dr. Walter Elmer, Clark University, Worcester, Massachusetts 1910
Emilio, Shepard Gilbert, 7 Winter St., Salem, Massachusetts 1929
English, Dr. Pennoyer Francis, Dept. Zoology, Pennsylvania State College, State College, Pennsylvania 1934
Ernst, Miss Lillie Rose, 6058 Kingsbury Av., St. Louis, Missouri 1935
Errington, Dr. Paul L[ester], Iowa State College, Ames, Iowa 1932
Feeney, W. S., 410 Walton Pl., Madison, Wisconsin 1937
Fleming, James Henry, 267 Rusholme Rd., Toronto 4, Ontario, Canada 1906
Floyd, Judge Joseph Larke, 1009-11 George D. Harter Bank Bldg., Canton, Ohio 1903

Fredine, C. Gordon, 1807 Wesley Av., St. Paul, Minnesota....1938
Friedmann, Herbert, U. S. National Museum, Washington, D. C....1932
Friley, Charles Edwin, Jr., The Knoll, Ames, Iowa....1937
Gabrielson, Dr. Ira Noel, Biological Survey, Washington, D. C....1913
Gault, Benjamin True, Wheaton Health Resort, Wheaton, Illinois....1895
Gregory, Stephen Strong, Jr., Box N, Winnetka, Illinois....1922
Grinnell, Dr. Joseph, Museum of Vertebrate Zoology, University of California, Berkeley, California....1914
Griscom, Ludlow, Museum of Comparative Zoology, Cambridge, Mass....1937
Guest, Mrs. Marjorie Lee, Athens State Hospital, Athens, Ohio....1924
Hand, Ralph Levi, 543 South 5th Street West, Missoula, Montana....1933
Handlan, John Welty, Ogelbay Park, Wheeling, West Virignia....1932
Hann, Dr. Harry Wilbur, Department of Zoology, University of Michigan, Ann Arbor, Michigan....1930
Hendrickson, Dr. George Oscar, Department of Zoology, Iowa State College, Ames, Iowa....1933
Herrick, Dr. Francis Hobart, 2863 Noble Rd., Cleveland Heights, Ohio....1917
Heston, Dr. Walter Enoch, Jackson Memorial Laboratory, Bar Harbor, Maine..1936
Hetler, Dr. Donald M., 322 Beckwith Av., Missoula, Montana....1935
Himmel, Dr. Walter J., Department of Botany, University of Nebraska, Lincoln, Nebraska....1915
Hinshaw, Thomas Doane, 1908 Scottwood Av., Ann Arbor, Michigan....1926
Hunt, Ormond Edson, 14-133 General Motors Bldg., Detroit, Michigan....1937
Jackson, Cicero Floyd, University of New Hampshire, Durham, N. H....1936
Jenner, William Alexander, 806 W. Davis St., Fayette, Missouri....1933
Johnson, Robert Anthony, State Normal School, Oneonta, New York....1930
Jones, Harold Charles, Thomas Berry College, Mount Berry, Georgia....1929
Jones, Harold Robert, 317 New York St., Scranton, Pennsylvania....1938
Jones, Sterling Price, 690 Bonita Ave., Webster Groves, Missouri....1935
Jung, Clarence Schram, 4612 N. Oakland Ave., Milwaukee, Wisconsin....1921
Kalmbach, Edwin Richard, 527 Custom House, Denver, Colorado....1926
Kase, John Charles, 221 De Hart, West Lafayette, Indiana....1937
Kehrer, Victor John, 910 Walnut St., Martins Ferry, Ohio....1937
Kelso, Leon, 241 Linden Av., Ithaca, New York....1930
Kendeigh, Dr. Samuel Charles, Experimental Zoological Laboratory, Wright and Healey Sts., University of Illinois, Champaign, Illinois....1923
Knappen, Miss Phoebe Malura, 2925 Tilden St. N. W., Washington, D. C....1926
Komarek, Roy Vance, Raleigh, North Carolina....1935
Laird, Miss Lonnie, 3664 Washington St., St. Louis, Missouri....1935
Lambert, Bert, Allenville, Michigan....1936
Larrabee, Prof. Austin Park, Yankton College, Yankton, South Dakota....1921
Laskey, Mrs. Amelia Rudolph, Graybar Lane, Nashville, Tennessee....1928
Leopold, Prof. Aldo, 1532 University Av., University of Wisconsin, Madison, Wisconsin....1928
Lewy, Dr. Alfred, 2051 E. 72nd Pl., Windsor Park, Chicago, Illinois....1915
Lopp, O. Vernon, 1502 Raymond Av., St. Paul, Minnesota....1936
MacCracken, Dr. Walter Harrington, Detroit College of Medicine and Surgery, 1516 St. Antoine St., Detroit, Michigan....1933
Mailliard, Joseph, 1815 Vallijo St., San Francisco, California....1930
Marshall, Miss Irma, Rugby, North Dakota....1938
Mayfield, Prof. George Radford, Vanderbilt University, Nashville, Tennessee....1917
McAtee, Waldo Lee, U. S. Biological Survey, Washington, D. C....1911
McCabe, Thomas Tonkin, Museum of Vertebrate Zoology, Berkeley, Calif....1928
McConnell, Harry Burns, Cadiz, Ohio....1935
McCreary, Otto, Agricultural Hall, University of Wyoming, Laramie, Wyo....1930
McCullagh, Dr. E[rnest] Perry, 2020 E. 93rd St., Cleveland, Ohio....1937
McKnight, Edwin Thor, 201 I St., N. W., Miami, Oklahoma....1936
McMath, Robert P., Route 4, Pontiac, Michigan....1934
Mershon, William Butts, Saginaw, Michigan....1910
Metcalf, Dr. Zeno Payne, State College, West Raleigh, North Carolina....1900
Minich, Edward C., 1047 Fairview Av., Youngstown, Ohio....1925

Mitchell, Mrs. Margaret Knox Howell, 69 Oriole Rd., Toronto, Canada....1933
Morse, Dr. Harry Gilman, Huron, Ohio....1914
Morse, Miss Margarette Elthea, 11432 Mayfield Rd., Cleveland, Ohio....1921
Moseley, Edwin Lincoln, State College, Bowling Green, Ohio....1925
Musgrave, Dr. John Knox, 350 Parkway Dr., Pittsburgh 16, Pennsylvania....1937
Mushbach, George E., Box 603, Brigham, Utah....1936
Neff, Johnson Andrew, Bureau of Biological Survey, 270 Federal Bldg., Sacramento, California....1920
Nice, Dr. Leonard B., Chicago Medical School, 710 S. Lincoln St., Chicago, Illinois....1932
Nice, Mrs. Margaret Morse, 5708 Kenwood Av., Chicago, Illinois....1921
Nichols, Charles Ketcham, 212 Hamilton Rd., Ridgewood, New Jersey....1933
Oberholser, Dr. Harry Church, 2805 18th St., N. W., Washington, D. C....1894
Oehlenschlaeger, Miss Elizabeth Auguste, 926 E. Kilbourn Av., Milwaukee, Wisconsin....1936
Olsen, Dr. Richard Ellsworth, St. Joseph's Hospital, Pontiac, Michigan....1937
Osgood, Dr. Wilfred Hudson, Field Museum of Natural History, Chicago, Ill....1910
Otis, Dr. Charles Herbert, Department of Biology, Bowling Green State University, Bowling Green, Ohio....1937
Over, Prof. William Henry, University Museum, Vermillion, South Dakota....1930
Palmer, Dr. Theodore Sherman, 1939 Biltmore St., N. W., Washington, D. C....1914
Palmgren, Dr. Pontus, Museum Zoologicum Universitatis, Helsenki, Suomi, Helsingfors, Finland....1935
Parker, Herbert, South Lancaster, Massachusetts....1928
Pemberton, John Roy, 3031 N. Lake Av., Altadena, California....1922
Perkins, Samuel Elliott, III, 709 Inland Bldg., Indianapolis, Indiana....1923
Pettingill, Dr. Olin Sewall, Jr., Department of Zoology, Carleton College, Northfield, Minnesota....1930
Phelps, Frank Mills, 312 5th St., Elyria, Ohio....1912
Phillips, Allan Robert, 113 Olive Rd., Tucson, Arizona....1934
Pirnie, Dr. Miles David, W. K. Kellogg Bird Sanctuary, Michigan State College, Battle Creek, Michigan....1928
Platford, Sidney D., 4166 Fifth Av., Los Angeles, California....1936
Poole, Miss Betty, 42 W. 30th St., Indianapolis, Indiana....1937
Pough, Richard Hooper, 144 East 45th St., New York, New York....1938
Preble, Edward Alexander, 3027 Newark St., Washington, D. C....1929
Presnall, Clifford Charles, 6335 Ridge Dr., Station A., Washington, D. C....1930
Prill, Dr. Albert G., Main St., Scio, Oregon....1933
Quillian, Marvin C., Wesleyan College, Macon, Georgia....1927
Randall, Mrs. W. S., 4424 Belclaire Av., Dallas, Texas....1925
Reeder, Miss Clara Maude, 318 College Av., Houghton, Michigan....1938
Renneckar, Miss Gertrude Idella, Smithville, Ohio....1938
Riley, Joseph Harvey, U. S. National Museum, Washington, D. C....1914
Rogers, Mrs. Walter E., 911 E. North St., Appleton, Wisconsin....1931
Rorimer, Mrs. Irene Turk, 22275 Parnell Rd., Shaker Heights, Ohio....1938
Rosene, Walter Melvin, Ogden, Iowa....1923
Rust, Henry Judson, Box 683, Coeur d'Alene, Idaho....1921
Satterthwait, Mrs. Elizabeth Allen, 806 W. Ohio St., Urbana, Illinois....1925
Saunders, Dr. George Bradford, 562 Custom House, Denver, Colorado....1926
Saunders, William Edwin, 352 Clarence St., London, Ontario, Canada....1902
Schorger, Dr. Arlie William, 168 N. Prospect Av., Madison, Wisconsin....1927
Schwerin, Mrs. Lotta Bean, Hotel Solano, Vallejo, California....1936
Scott, Dr. John W[illiam], 400 W. 27th St., Cheyenne, Wyoming....1937
Shaffer, Chester Monroe, Dorcas, West Virginia....1934
Sheffler, William James, 4731 Angeles Vista Blvd., Los Angeles, California....1937
Shelford, Dr. Victor Ernest, Vivarium Bldg., Wright and Healey Sts., Champaign, Illinois....1931
Shepherst, Max [John], 536 Walden Av., Toledo, Ohio....1937
Skinner, Milton Philo, 1316 Harding St., Long Beach, California....1926
Smith, Frank, 79 Fayette St., Hillsdale, Michigan....1910
Smith, Frank Rush, Route 2, Box 100, Laurel, Maryland....1930

Smith, Harry Madison, 2007 Calumet Av., Whiting, Indiana....1936
Smith, Roy Harmon, 183 N. Prospect St., Kent, Ohio....1936
Sperry, Charles Carlisle, U. S. Biological Survey, Denver, Colorado....1931
Spiker, Charles Jolley, Branchport, New York....1916
Stebbins, Miss Fannie Adell, 31 Ely Av., West Springfield, Massachusetts....1935
Stillwell, Jerry E., 7460 San Benito Ray, Route 4, Dallas, Texas....1935
Stoner, Dr. Dayton, New York State Museum, Albany, New York....1912
Stuart, Miss Anne, 1905 D St., Lincoln, Nebraska....1924
Suthard, James Gregory, 832 Ohio St., Long Beach, California....1936
Swanson, Dr. Gustav Adolph, Division of Economic Zoology, University of Minnesota, University Farm, St. Paul, Minnesota....1927
Taylor, Dr. Aravilla Meek, Lake Erie College, Painesville, Ohio....1936
Taylor, Walter Penn, 254 Faculty Exchange, College Station, Texas....1937
Thacker, Miss [Lillian] Maxine, Route 3, Buckhannon, West Virginia....1938
Thomas, Edward Sinclair, 1116 Madison Av., Columbus, Ohio....1921
Tift, Richard, Madison Terrace Apts., Albany, Georgia....1937
Tinker, Almerin David, 519 Oswego St., Ann Arbor, Michigan....1909
Townsend, Miss Elsie White, Wayne University, Detroit, Michigan....1938
Tyler, Dr. Winsor Marrett, 112 Pickney St., Boston, Massachusetts....1914
Valentine, Miss Marguerite Elsie, 66 Robinson Av., Glen Cove, Long Island, New York....1937
Van Tyne, Dr. Josselyn, Museum of Zoology, Ann Arbor, Michigan....1922
Vaughan, William Coleman, 591 Ashland Av., Buffalo, New York....1938
Visscher, Dr. Paul, Biology Laboratory, Western Reserve University, Cleveland, Ohio....1924
Walkinshaw, Dr. Lawrence Harvey, 1421 W. Michigan Av., Battle Creek, Michigan....1928
Warren, Edward Royal, 1511 Wood Av., Colorado Springs, Colorado....1911
Weber, Orlando Franklin, Jr., Mt. Kisco, New York....1936
Webster, Walter A., Sycamore Lawn Farm, Route 1, Quaker City, Ohio....1935
Wetmore, Dr. Alexander, U. S. National Museum, Washington, D. C....1903
Weydemeyer, Winton, Fortine, Montana....1930
White, Francis Beach, St. Paul's School, Concord, New Hampshire....1926
Wilson, Archie Francis, 1921 Lake Av., Whiting, Indiana....1937
Wilson, Gordon, 1434 Chestnut St., Bowling Green, Kentucky....1925
Wineman, Andrew, 150 Michigan Av., Detroit, Michigan....1934
Wing, Leonard William, Box 364, Norris, Tennessee....1924
Wood, Dr. Casey Albert, Wood Library of Ornithology, McGill University, Montreal, Canada....1924
Yeatter, Dr. Ralph Emerson, Illinois Natural History Bldg., Urbana, Illinois....1932
York, Mrs. Olive Rogers, 862 Hoffman St., Elmira, New York....1938
Zimmerman, Harold Alexander, 915 W. Gilbert St., Muncie, Indiana....1932

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Adams, I. C., Jr., 1600 Hinkson St., Columbia, Missouri....1933
Adelson, Richard Henry, 3348 167th St., Flushing, New York....1938
Aitkin, Andrew Drummond, Jr., Box 411, Greggton, Texas....1936
Alexander, Gordon, Department of Biology, University of Colorado, Boulder, Colorado....1936
Alexander, Donald Child, 18 Hurd St., Lowell, Massachusetts....1937
Allen, Arthur Francis, 108 Terrace Apts., Sioux City, Iowa....1925
Allen, Robert Ward, Ossian, Iowa....1936
Allender, Miss Christia [Hysel], Central High School, Tulsa, Oklahoma....1937
Allert, Oscar Paul, Route 1, McGregor, Iowa....1923
Amadon, Dean, 356 W. 34th St., New York, New York....1935
Ambrosen, Donald Roy, 315 E. King St., Winona, Minnesota....1937
Ammann, George Andrew, 272 Rockaway Av., Boonton, New Jersey....1935
Amundson, Gene, Valentine, Nebraska....1936
Anderson, Anders Harold, Box 111, Tucson, Arizona....1937

Anderson, Dr. Rudolph Martin, Division of Biology, Department of Mines and Resources, National Museum of Canada, Ottawa, Ontario, Canada....1937
Appleton, John Sparhawk, 1332 N. Citrus Av., Hollywood, California....1936
Arnold, Miss Cordelia H., 17 N. Hanover Av., Atlantic City, New Jersey....1937
Arthur, Stanley Clisby, 1309 State St., New Orleans, Louisiana....1937
Austin, Dr. Oliver Luther, Tuckahoe, Westchester Co., New York....1930
Axley, Mrs. Jessie Loew, Washburn, Wisconsin....1938
Ayer, Mrs. Nathan Edward, 1300 Hillcrest Dr., Pomona, California....1936
Babcock, Mrs. Lester, 402 Madison Av., Milton, Wisconsin....1936
Bailey, Mrs. Florence Merriam, 1834 Kalorama Rd., Washington, D. C....1911
Bailey, Mrs. Mary L., 610 20th St., Sioux City, Iowa....1918
Baird, Mrs. Charles, 1631 Laurel Av., Knoxville, Tennessee....1938
Baker, John Hopkinson, 1165 5th Av., New York, New York....1930
Baker, Rollin Harold, Department of Geology, College Station, Texas....1938
Baker, William Calvin, 223 W. Pershing St., Salem, Ohio....1931
Baldwin, John H., Box 36A, Ludlow, Kentucky....1938
Ballard, J. O., 5388 Waterman Av., St. Louis, Missouri....1935
Bamberg, John, Tennessee Valley Authority, Joe Wheeler Dam, Alabama....1936
Barber, Dr. Bertram Alpha, 350 West St., Hillsdale, Michigan....1923
Barkalow, Frederick Schenck, Jr., Box 671, Alabama Polytechnic Institute, Auburn, Alabama....1938
Barnett, Miss Dorothy I., 3820 N. Newhall St., Milwaukee, Wisconsin....1933
Bartow, Mrs. Leslie W., 211 E. Hudson St., Columbus, Ohio....1938
Bassett, Mrs. Victor Hugo, 1010 E. Park Av., Savannah, Georgia....1931
Batchelder, Charles Foster, 7 Kirkland St., Cambridge, Massachusetts....1927
Bates, Charles Evarts, Box 34, East Wareham, Massachusetts....1937
Baumgartner, Dr. Frederick Milton, 629 E. Grand River, East Lansing, Michigan....1935
Baumgartner, Luther LeRoy, Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio....1936
Beard, Daniel B., 910 Columbus Blvd., Coral Gables, Florida....1938
Beatty, Harry Andrew, Christiansted, St. Croix, Virgin Islands, U. S. A....1936
Beebe, Ralph, 353 Salliotte St., Ecorse, Michigan....1924
Beeghly, James Leon, 46 Woodview Av., Youngstown, Ohio....1933
Behle, William Harroun, Department of Biology, University of Utah, Salt Lake City, Utah....1935
Bellrose, Frank, Jr., 1220 W. Madison St., Ottawa, Illinois....1935
Benchley, Edwin Allen, Jr., 79 Buckminster Rd., Brookline, Massachusetts....1937
Benedict, Mrs. Howard Smith, 18320 Kinsman Rd., Shaker Heights, Cleveland, Ohio....1926
Bennett, Logan Johnson, IA Horticulture Bldg., Pennsylvania State College, State College, Pennsylvania....1934
Benson, Frank Weston, 14 Chestnut St., Salem, Massachusetts....1937
Benson, Mrs. Mary Heydwiller, 310 Elmwood Av., Ithaca, New York....1937
Benson, Dr. Seth Bertram, Museum of Vertebrate Zoology, Berkeley, Calif....1930
Bierens, Rev. G. C., Fairmount, North Dakota....1936
Birkeland, Henry, Roland, Iowa....1934
Black, Charles Theodore, 3836 Lowell Av., Chicago, Illinois....1935
Blair, W. Frank, Museum of Zoology, University of Michigan, Ann Arbor, Michigan....1936
Blincoe, Mrs. Benjamin J., Route 1, Dayton, Ohio....1926
Bodine, Miss Margaret Lamb, Rittershouse Plaza, 19th and Walnut St., Philadelphia, Pennsylvania....1930
Bohning, Leonard L., Box 350, Knox, Indiana....1935
Bolt, Benjamin Franklin, 5300 Brookside Blvd., Kansas City, Missouri....1930
Bond, Richard Marshall, 328 East Islay St., Santa Barbara, California....1936
Boone, Miss Delia Robinson, 1044 2nd St., N. W., Grand Rapids, Michigan....1938
Bordner, Mrs. Frances Comfort, Hudson, Iowa....1930
Borell, A. E., Soil Conservation Service, Albuquerque, New Mexico....1936
Borror, Dr. Donald Joyce, Department of Zoology and Entomology, Columbus, Ohio....1927

Boulton, Rudyerd, Field Museum, Chicago, Illinois....1922
Bowdish, Beecher Scoville, Demarest ,New Jersey....1924
Bowman, Lawrence Lincoln, Orchard Hills, Route 7, North Canton, Ohio....1935
Brady, Dr. John A., St. Augustine College, Lakewood, Ohio....1925
Braun, Howard Wylie, 1413 Louisiana Av., N. W., Canton, Ohio....1937
Braund, Frank William, 1022 Central Av., Cleveland, Ohio....1935
Brooks, Alonzo Beecher, Oglebay Park, Wheeling, West Virginia....1931
Broun, Maurice, Rt. 1, Orwigsburg, Pennsylvania....1935
Brown, John Wilcox, Dartmouth Outing Club, Hanover, New Hampshire....1932
Brown, Robert Bowen, Jr., 806 Rosewood Av., Winnetka, Illinois....1935
Brown, Mrs. William, Edgewater Park, Celina, Ohio....1936
Buchanan, Borden Campbell, 100 S. Cecelia St., Sioux City, Iowa....1937
Bujak, Boleslaus Joseph, Museum of Zoology, Ann Arbor, Michigan....1936
Burk, Walter Leon, 701 E. 3rd St., Vinton, Iowa....1937
Burt, Dr. William Henry, Museum of Zoology, Ann Arbor, Michigan....1928
Burroughs, Raymond Darwin, Game Division, Department of Conservation, Lansing, Michigan....1937
Buss, Irven O., Faville Grove Wildlife Area, Lake Mills, Wisconsin....1936
Cain, Brighton C[lark], Box 796, Oakland, California....1934
Calhoun, John Bumpass, % U. S. Hayes, Cabell Av., University, Virginia....1935
Calvert, Earl Wellington, Haliburton P. O., Ontario, Canada....1937
Campbell, Louis Walter, 304 Fearing Blvd., Toledo, Ohio....1926
Campbell, Miss Mildred Florence, 29 N. Hawthorne Lane, Indianapolis, Ind....1938
Campbell, S. H., Oak Grove, Louisiana....1934
Carlson, Prof. Carl Olof, Department of Biology, Doane College, Crete, Nebr....1923
Carpenter, John Richard, 2670 N. Alpine Rd., Grand Rapids, Michigan....1934
Carter, John Darlington, Lansdowne, Pennsylvania....1930
Cartwright, Bertram William, 238 Guilford St., Deer Lodge, Winnipeg, Can....1930
Chamberlain, Glen David, 22 Academy St., Presque Isle, Maine....1930
Chapman, Floyd Barton, 1944 Denune Av., Columbus, Ohio....1932
Cheathum, Mrs. Edith, Biology Department, Southern Methodist University, Dallas, Texas....1936
Chutter, Miss Mildred C., Box 229, Athens, Ohio....1936
Clapp, Alston. Sr., 1115 Cotton Exchange Bldg., Houston, Texas....1934
Clark, Mrs. Ella Lamson [Mrs. C. C.], 922 N. Third St., Burlington, Iowa....1925
Clarke, Dr. Charles Henry Douglas, Department of Mines and Resources, Mines and Geology Branch, National Museum of Canada, Ottawa, Ontario, Canada....1932
Clebsch, Alfred, Route 1, Clarksville, Tennessee....1935
Clout, George John, 89 North St., St. Catherines, Ontario....1935
Clow, Miss Marion, Box 163, Lake Forest, Illinois....1929
Cole, Harry Maurice, 3016 Capitol Av., Cheyenne, Wyoming....1935
Cole, Dr. W. Storrs, Geology Dept., Ohio State University, Columbus, Ohio....1937
Coles, Victor, 2910 Grasselli Av., Cincinnati, Ohio....1929
Compton, Lawrence Verlyn, Soil Conservation Service, Box 1314, Aubuquerque, New Mexico....1923
Compton, Miss Leila Anna, 846 E. Bowman St., Wooster, Ohio....1930
Conrad, Charles Louis, 423 Warwood Av., Wheeling, West Virginia....1937
Cook, Grant MacDonald, 2301 Elm St., Youngstown, Ohio....1923
Cooley, Miss Eleanor Graham, R. F. D., Berwyn, Maryland....1936
Counce, Dr. Cynthia Cunningham, Lynnhurst Sanitarium, Oakville, Tennessee....1937
Courtright, Mrs. Mary L., 3 Elm Av., Larkspur, California....1937
Cox, Rodman D., 785 South Av., Rochester, New York....1933
Crabb, Wilfred Dayton, 3814 Ridge Av., Sioux City, Iowa....1937
Crawford, Eugene E., 445 North 8th St., Corvallis, Oregon....1936
Crook, Compton N., Jr., Matthew Whaley School, Williamsburg, Virginia....1929
Crow, Louis W., Niles Center, Illinois....1936
Cunningham, James W., 4425 Main St., Kansas City, Missouri....1935
Currier, Edmonde Samuel, 8541 N. Chicago Av., Portland, Oregon....1930
Curtis, Miss Elizabeth Long, 5648 Beach Dr., Seattle, Washington....1935

Cuthbert, Nicholas LeHuray, Genetics Bldg., University of Wisconsin, Madison, Wisconsin 1937
Dalke, Dr. Paul David, Division of Wildlife Research, Missouri Wildlife Research Unit, Columbia, Missouri 1936
Damon, David, SP-20, Kaiser, Missouri 1933
Danforth, Charles Garrison, 1680 College Av., Palo Alto, California 1938
Danner, Mrs. May S., 1646 Cleveland Av., N. W., Canton, Ohio 1921
Davidson, Mrs. Gaylord, 4735 S. Dupont Av., Minneapolis, Minnesota 1938
Davidson, William Mark, Route 1, Silver Spring, Maryland 1933
Davis, Edward M., Winter Park, Florida (Nov. 1-May 1), and Shirley, Massachusetts (May 1-Nov. 1) 1936
Davis, George, State Teachers College, Murfreesboro, Tennessee 1936
Davis, Mrs. Louie Irby, Box 988, Harlingen, Texas 1933
Davis, Dr. William B., Department of Wild Game, College Station, Texas 1938
Dawley, Jean Wilson, 13962 Clifton Blvd., Lakewood, Ohio 1931
Debes, Victor Albert, 1211 Folsom Av., Prospect Park, Pennsylvania 1937
Denton J[ames] Fred, Jr., Department of Zoology, University of Georgia, Athens, Georgia 1935
Deusing, Murl, 142 N. 75th St., Milwaukee, Wisconsin 1937
Devitt, Otto Edmund, 31 Willowbrook Blvd., Toronto, Ontario, Canada 1935
Dille, Frederick Monroe, 822 Grand Av., Nogales, Arizona 1912
Dingle, Edward von Seibold, Huger, South Carolina 1921
Dixon, James Benjamin, Box 688, Escondido, California 1936
Dodge, Ernest Stanley, Peabody Museum, Salem, Massachusetts 1936
Dodson, Joseph Howard, 701 S. Harrison Av., Kankakee, Illinois 1936
Dole, J. Wilbur, 51 E. Stone St., Fairfield, Iowa 1930
Dolley, John Seiver, Box 75, University, Mississippi 1937
Domm, Dr. Lincoln Valentine, Whitman Laboratory for Experimental Zoology, University of Chicago, Chicago, Illinois 1936
Drum, Miss Margaret, Owatonna, Minnesota 1937
Dunaway, Mrs. Nell Lively, 910 S. 8th St., Lawton, Oklahoma 1937
Dyer, Mrs. Minnie M., Byington, Tennessee 1930
Easton, Robert S., 904 Moss Av., Peoria, Illinois 1936
Eastwood, Sidney Kingman, 301 S. Winebiddle Av., Pittsburgh, Pennsylvania 1928
Ebersole, Frank Boyd, 1656 Richardson St., Fort Wayne, Indiana 1937
Eckelberry, Donald [Richard], 133 West Indiana Av., Sebring, Ohio 1938
Edge, Mrs. Charles Noel, 1200 Fifth Av., New York, New York 1931
Eheim, Joseph Mathious, Hutchinson, Minnesota 1926
Eike, James, Box 4, Woodbridge, Virginia 1933
Elder, William Hanna, Biology Building, University of Wisconsin, Madison, Wisconsin 1918
Eliot, Samuel Atkins, Jr., 32 Paradise Rd., Northampton, Massachusetts 1932
Elrod, Mrs. Walter DeWitt, Box 103, Okmulgee, Oklahoma 1923
Emery, Frank Hardie, 620 Euclid Av., Toronto, Ontario, Canada 1933
Emlen, Dr. John Thompson, Jr., University of California, Davis, California 1936
Engleby, Thomas Lester, 1002 Patterson Av., Roanoke, Virginia 1934
Erickson, Arnold Burton, Department of Zoology, University of Minnesota, Minneapolis, Minnesota 1938
Erickson, Miss Mary Marilla, Willamette University, Salem, Oregon 1930
Erwin, W. G., Henderson State Techers College, Arkadelphia, Arkansas 1936
Evans, Dr. Evan Morton, 550 Park Av., New York, New York 1929
Evans, Thomas R., Kasson, Minnesota 1937
Evins, Samuel N., 38 E. 14th St., Atlanta, Georgia 1921
Eynon, Alfred Ernest, 1718 Andress Terrace, Union, New Jersey 1938
Fautin, Reed Winget, Box 307, R. F. D. 2, Provo, Utah 1937
Feighner, Miss Lena Veta, 298-I S. Tremont St., Kansas City, Kansas 1935
Felton, W. R., 1709 Summit St., Sioux City, Iowa 1934
Finster, Miss Ethel Beulah, Asheville Teachers College, Ashville, North Carolina 1930
Fisher, Miss Edna M., 2410 Fulton St., Berkeley, California 1938

Fitzpatrick, Dr. Frederick Linder, Teachers College, Columbia University, New York, New York....1924
Fleetwood, Raymond Judy, S. & B. Court Hall St., Madisonville, Kentucky....1934
Flentge, Louis George, Box 68, Wheeling, Illinois....1936
Fletcher, William Barger, Box 188, Savannah, Missouri....1937
Foote, Maurice Edwin, 66 Joslyn Pl., Rochester, New York....1932
Forbes, John Ripley, 9 East Av., Ithaca, New York....1937
Force, Miss Edith Rhoda, 3021 E. 8th St., Tulsa, Oklahoma....1931
Fossler, Miss Mary Louise, 550 N. Los Robles Av., Pasadena, California....1936
Foster, George, 15 W. Circle Dr., Norris, Tennessee....1935
Fowle, John Trenchard, Route 2, Vernon ,British Columbia, Canada....1936
Fox, Adrian Casper, Box 367, Soil Conservation Service, Fargo, North Dakota..1937
Frazer, Dr. T. Atchinson, Marion, Kentucky....1934
Friauf, James J., 930 Dewey Av., Ann Arbor, Michigan....1936
Frishman, Kenneth, 1114 9th Av. S., Fargo, North Dakota....1936
Frost, Marvin. Asheville School, Asheville, North Carolina....1937
Frothingham, Mrs. Randolph, 56 Sargent Crossway, Brookline, Massachusetts..1932
Fryklund, P. O., Roseau, Roseau Co., Minnesota....1926
Furniss, Owen Cecil, 2203 1st Ave., West Prince Albert, Sask., Canada....1934
Gail, John F., 1450 Warren Av., Chicago, Illinois....1936
Ghigi, Alessandro, R. Universita, Bologna, Italy....1931
Gier, Dr. Herschel Thomas, Ohio University, Athens, Ohio....1937
Gifford, Dr. Harold, 323 S. 51st St., Omaha, Nebraska....1936
Gilbert, Dr. Winifred, 524 W. 24th St., Cedar Falls, Iowa....1936
Gill, Geoffrey [Trafford Holmes],24 Overlook Dr., Huntington, Long Island, New York....1934
Gillett, Francis C., Box 1269, Omaha, Nebraska....1935
Glenn, Robert W., 509 Orchard Av., Avalon, Pittsburgh, Pennsylvania....1934
Goerlitz, George, 520 E. Main St., Boonville, Indiana....1934
Goldsmith, Glenn Warren, Box 1611, University Station, Austin, Texas....1931
Good, E. E., 1310 High St., Hamilton, Ohio....1936
Gordon, C. E., Fennimore, Wisconsin....1936
Goslin, Robert Martin, 312 Wilson Av., Columbus, Ohio....1936
Grant, Cleveland Putnam, 620 Greenup St., Covington, Kentucky....1928
Grater, Russell K., Box 395, Boulder City, Nevada....1936
Greene, Earle Rosenbury, Okefenokee Wildlife Refuge, Fargo, Georgia....1930
Gresham, Albert Burton, Winnipeg Free Press, Winnipeg, Manitoba....1934
Grimes, Samuel Andrew, Rt. 5, Box 284F, Jacksonville, Florida....1924
Groskin, Horace, 220 St. Georges Rd., Ardmore, Pennsylvania....1937
Gross, Dr. Alfred Otto, Bowdoin College, Brunswick, Maine....1927
Gross, Miss Margaret Edith, Route 5, Grand Rapids, Michigan....1937
Guion, George Seth, 1701 American Bank Bldg., New Orleans, Louisiana....1935
Guthrie, Frank Keller, Keuka Park, New York....1938
Hadley, Miss Theodosia Hamilton, Western State Teachers College, Kalamazoo, Michigan....1938
Haecker, Frederick Woods, 506 S. 52nd St., Omaha, Nebraska....1938
Hagar, Mrs. Jack, Rockport, Texas....1930
Hague, Dr. Florence S., Sweet Briar College, Sweet Briar, Virginia....1931
Hainsworth, William Pickard, 214 Railroad Av., North Andover, Mass....1930
Hale, Arthur Thomas, Jr., Box 753, Mission, Texas....1935
Hall, Fred Thomas, 1215 Danville Av., Crawfordsville, Indiana....1936
Haller, Karl William, Route 1, Short Creek, West Virginia....1934
Hallman, Roy Cline, Box 826, Panama City, Florida....1928
Hamerstrom, Frederick N., Jr., % Aldo Leopold, University of Wisconsin, Madison, Wisconsin....1934
Hamilton, B. G., Box 22, Highland Park, Illinois....1936
Hamilton, Dr. William John, Jr., Department of Zoology, Cornell University, Ithaca, New York....1933
Handley, Charles Overton, Virginia Polytechnic Institute, Blacksburg, Va....1925
Hanna, Wilson Creal, 141 E. F St., Colton, California....1936
Happ, Prof. George Bippus, The Principia College, Elsah, Illinois....1935

Harford, Dr. Henry Minor, 1034 Argyle Bldg., Kansas City, Missouri....1938
Harkin, Hon. James Bernard, Department of Interior, Ottawa, Ontario, Can....1924
Harllee, Capt. Harry Lee, 900 S. Irby St., Florence, South Carolina....1936
Harmanson, J. S. W., 333 Royal St., New Orleans, Louisiana....1937
Harper, Dr. Francis, 224 S. Chester Rd., Swarthmore, Pennsylvania....1930
Harris, Curtis Lea, 921 W. Central St., Eldorado, Kansas....1928
Harris, Mrs. William Gray, Pine Ledges, Old Boylston ,Massachusetts....1932
Hartman, Fred Oscar, 523 Hackett Rd., Toledo, Ohio....1938
Hatch, Dr. Alden Bruce, School of Forestry, University of Idaho, Moscow, Idaho....1937
Hausler, Mrs. M., 7348 Paxton Av., Chicago, Illinois....1936
Hawkins, Arthur S., Illinois Natural History Survey, Urbana, Illinois....1936
Hawkins, B. L., Hamline University, St. Paul, Minnesota....1936
Hayward, C. Lynn, Dept. Entomology and Zoology, Brigham Young University, Provo, Utah....1933
Hayward, W. J., Box 1282, Sioux City, Iowa....1913
Heaton, Leonard, Moccasin, Arizona....1937
Hedge, Homer William, 607 New York Av., Holton, Kansas....1936
Helfer, Miss Louise, 111 Ninth St., Watkins Glenn, New York....1937
Hellwig, Miss Isabelle, 1299 Green Rd., South Euclid, Ohio....1936
Henderson, Walter Cleaveland, 8 Magnolia Parkway, Chevy Chase, Maryland..1928
Henderson, [William] Grant, Route 6, Greensburg, Indiana....1930
Henika, Franklin S., 207 Whitman Av., Pullman, Washington....1936
Henry, Cordia John, Box 37, Upham, North Dakota....1933
Herrick, Miss Eleanor Elizabeth, 935 Smith Lane, Woodmere, Long Island, New York....1935
Herman, Carlton Martin, 615 N. Wolfe St., Baltimore, Maryland....1937
Hicks, Mrs. E. H., Fredericktown, Ohio....1932
Hiett, Lawrence Davison, 2134 Parkwood Av., Toledo, Ohio....1929
Hill, Herbert Oliver, 132 West Lincoln Av., Mt. Vernon, New York....1938
Hill, Julian Werner, 707 Coverdale Rd., Wilmington, Delaware....1935
Hillmer, Davis B., 454 Colburn Pl., Detroit, Michigan....1926
Hilton, Dr. David Clark, 305 Richards Bldg., Lincoln, Nebraska....1918
Hinchman, Richard May, 75 Fairbanks Rd., Milton, Massachusetts....1931
Hinds, Frank J., Dept. Biology, Western State Teachers College, Kalamazoo, Michigan....1935
Hoag, Ena, Box 407, Pacific Grove, California....1934
Hobson, Mrs. L. G., 1155 Dove Rd., Louisville, Kentucky....1935
Hoffman, Edward Carlton, 1041 Forest Cliff Drive, Lakewood, Ohio....1937
Holland, Harold May, Box 615, Galesburg, Illinois....1915
Holt, Ernest Golsan, 2121 New York Av., Washington, D. C....1926
Hostetter, D. Ralph, Eastern Mennonite School, Harrisonburg, Virginia....1937
Howard, William J., % National Park Service, Richmond, Virginia....1935
Howell, Joseph Corwin, Laboratory of Ornithology, Cornell University, Ithaca, New York....1938
Hoyt, John Southgate Yeston, 5 Lewis St., Lexington, Virginia....1936
Hudson, Dr. George Elford, Department of Zoology and Anatomy, University of Nebraska, Lincoln, Nebraska....1933
Huey, Laurence Markham, Natural History Museum, Balboa Park, San Diego, California....1932
Huggins, Russell Arno, Biology Department, Western Reserve University, Cleveland, Ohio....1937
Hughes, George Thomas, Box 153, Plainfield, New Jersey....1929
Hulbert, Lloyd Clair, 529 W. Grand River Av., East Lansing, Michigan....1938
Hunter, Lawrence E., Hanna City, Illinois....1934
Hurley, John Beatty, 401 S. 17th Av., Yakima, Washington....1937
Ijams, Henry Pearle, % News-Sentinel, Knoxville, Tennessee....1924
Imler, Ralph Hysel, Food Habits Research Laboratory, 562 Custom House, Denver, Colorado....1937
Ingersoll, Albert Mills, 908 F St., San Diego, California....1921
Jackson, Norma R., Box 215, Campe Verde, Arizona....1935

Jacobson, Karl A., Division of Wildlife Research, Department of Forestry, University of Maine, Orono, Maine....1936
Jelier, Franciscus Peter, Groote Visscherystraat 19a, Rotterdam, Holland....1931
Jenks, Randolph, Rancho Esperero, University Station, Tucson, Arizona....1934
Jenkins, Miss Betty, Oak Hill, Ohio....1936
Jenkins, Dale W., 38 N. Chase Av., Columbus, Ohio....1937
Jensen, Jesse Peter, Box 364, Dassel, Minnesota....1926
Jessman, Miss Lena M., 11 Linden Ave., River Rouge Bch., Detroit, Michigan....1935
Jewett, Homer, 2680 West Paris Blvd., Shaker Heights, Ohio....1937
Johnson, Archibald, Route 2, Jamestown, North Dakota....1934
Johnson, D. Elmer, 266 Lava St., Hot Springs, Idaho....1934
Johnson, Delos Edward, 42 Public Square, Shelbyville, Indiana....1934
Johnson, Frank, 1202 Kenwood Av., Fort Wayne, Indiana....1935
Johnson, Mrs. [Oscar] Irene W., 38 Portland Pl., St. Louis, Missouri....1931
Johnson, Paul H., Soil Conservation Service, Bethany, Missouri....1936
Jones, E. W., 3335 Monte Vista, Albuquerque, New Mexico....1936
Jones, John Courts, 3224 19th St. N. W., Washington, D. C....1931
Jones, Paul F., 1724 Michigan St., Toledo, Ohio....1937
Jones, Solomon Paul, 509 West Av., N., Waukesha, Wisconsin....1921
Jones, Victor Emmons, University of Idaho, Southern Branch, Pocatello, Idaho....1938
Kamm, Mrs. Oliver, 365 Lake Shore Dr., Grosse Point Farms, Michigan....1934
Kelker, George Hills, School of Forestry, U. S. A. C., Logan, Utah....1938
Kellogg, Dale Cosnett, Box 343, Norwalk, Ohio....1932
Kelly, Mrs. George A., 2300 La Salle Gardens, N., Detroit, Michigan....1935
Kennedy, Homer Ney, Box 294, Rosslyn, Virginia....1935
Kindler, Mrs. Grace Emma, Sheridan Dr., Lancaster, Ohio....1937
Klein, Jacob, Box 424, Shawano, Wisconsin....1936
Klepfer, Ward, 169 Morris Av., Buffalo, New York....1934
Knapp, Elmer Leslie, Route 2, Troy, Pennsylvania....1930
Knight, Dr. Harry Hazelton, Department of Zoology and Entomology, Iowa State College, Ames, Iowa....1926
Knox, Miss Margaret Richardson, 4030 Park Av., Indianapolis, Indiana....1937
Kobes, Karl George, Division of Economic Zoology, University Farm, St. Paul, Minnesota....1938
Koestner, E. J., 203 Experimental Laboratory Building, University of Illinois, Champaign, Illinois....1938
Kolb, Charles Haven, Jr., 5210 Catalpha Rd., Baltimore, Maryland....1937
Kriebel, Ralph Meschter, 1111 N. St., Bedford, Indiana....1935
Kummerloewe, Dr. Hans, Staatliche Museum fur Tierkunde u. Volkerkunde, Zwinger, Dresden-A. 1, Germany....1931
Langenbach, John R., 1603 N. 2nd St., Harrisburg, Pennsylvania....1936
Lay, George Balch, State College, Raleigh, North Carolina....1938
Lee, Robert E., Soil Conservation Service, Greenfield, Iowa....1936
Leedy, Charles A., 343 Falls Av., Youngstown, Ohio....1927
Leedy, Daniel L., Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio....1936
Leigh, W. Henry, 301 Natural History Bldg., Urbana, Illinois....1936
Lewis, John Barzillai, Box 853, Amelia, Virginia....1924
Lewis, Merriam Garretson, Box 549, Salem, Virginia....1930
Lincoln, Frederick Charles, U. S. Biological Survey, Washington, D. C....1914
Lindsey, Dr. Alton Anthony, Department of Biology, American University, Washington, D. C....1936
Linsdale, Dr. Jean Myron, Museum of Vertebrate Zoology, University of California, Berkeley, California....1928
Little, Dr. Ethel Esther, State Teachers College, Minot, North Dakota....1937
Lloyd, C. K., 11 N. Elm St., Oxford, Ohio....1925
Lloyd, Hoyes, 582 Mariposa Av., Rockcliffe Park, Ottawa, Ontario, Canada....1922
Lodge, William Ralph, Silver Lake Estates, Route 2, Cuyahoga Falls, Ohio....1935
Lomax, Dr. Claude C., 503 S. Willow Rd., Evansville ,Indiana....1921

Long, Charles F., 203 E. Broad St., Columbus, Ohio....1934
Long, Wilbur Stuart, 1116 E. San Rafael, Colorado Springs, Colorado....1936
Long, William Henry, Jr., 1334 White St., Ann Arbor, Michigan....1933
Lovell, Harvey B., 3011 Meade Av., Box 216, Louisville, Kentucky....1936
Low, Seth Haskell, Des Lacs Waterfowl Refuge, Kenmore, North Dakota....1931
Lowery, George Hines, Box 376, Louisiana State University, Baton Rouge, Louisiana....1937
Lubin, Seymour I., 101 Chestnut St., Binghampton, New York....1934
Lunk, William, Jr., Fleming Av., Edgemont, Fairmont, West Virginia....1937
Luthy, Ferd, Jr., 306 N. Institute, Peoria, Illinois....1937
Lynes, Miss Florence A., Cookstation, Missouri....1937
MacArthur, Edward, 2400 Forestdale Av., Cleveland, Ohio....1936
Mac donald, Donald, 19 Werner Pk., Rochester, New York....1937
Mack, Horace Gordon, % Gilson Mfg. Co. Ltd., Guelph, Ontario, Canada....1937
MacLulich, Dr. Duncan Alexander, 144 Mavety St., Toronto 9, Ontario, Can....1933
MacRae, John W., 307 2nd St. S., Virginia, Minnesota....1937
Magath, Dr. Thomas B., Mayo Clinic, Rochester, Minnesota....1935
Maguire, Walter Stanley, Y. M. C. A., New Westminister, British Columbia....1937
Main, John Smith, 2210 Van Hise Av., Madison, Wisconsin....1936
Malley, Philip Patrick, Box B, Munhall, Pennsylvania....1935
Malloy, Dr. James Patrick, Castalia, Iowa....1937
Malloy, Mrs. R. B., 418 W. 3rd Av., Corsicana, Texas....1930
Marden, Aaron, Eagle Island, South Harpswell, Maine....1933
Markle, Dr. Millard S., 528 National Av., Richmond, Indiana....1938
Marks, Miss Ica, 1435 6th St., Charleston, Illinois....1936
Marsh, Vernon L., 5808 15th Av., N. E., Seattle, Washington....1934
Maslowski, Karl Herbert, 950 Glenwood Av., Cincinnati, Ohio....1934
Mason, Robert French, Jr., 2415 California St., N. W., Washington, D. C....1937
Mayr, Dr. Ernst, American Museum of Natural History, New York, N. Y....1933
McBeath, Donald Young, Midland Game Refuge, Sanford, Michigan....1936
McClanahan, Robert Charles, 1700 E. Avery St., Pensacola, Florida....1935
McConnell, Miss Mary Lou, 151 Center Av., Emsworth, Pennsylvania....1936
McCracken, Dr. Isabel, Box 1545, Stanford University, California....1936
McCullough, George W., 4858 Lyndale Av., Minneapolis, Minnesota....1937
McDonald, Malcolm, 320 S. Clinton St., Iowa City, Iowa....1936
McGill, Dr. J. T., Vanderbilt University, Nashville, Tennessee....1929
McGraw, Harry A., 1600 5th Av., Altoona, Pennsylvania....1936
McNeil, Dr. Charles Andrew, 111 W. Fourth St., Sedalia, Missouri....1914
Meade, Dr. Gordon Montgomery, Strong Memorial Hospital, Crittenden Blvd., Rochester, New York....1937
Meltreat, Burton W., Paullina, Iowa....1930
Mendall, Howard L., 28 Pendleton St., Brewer, Maine....1936
Mengel, Robert Morrow, The Hill School, Pottstown, Pennsylvania....1937
Mendenhall, Eugene W., 97 Brighton Rd., Columbus, Ohio....1932
Merriam, Dr. Clinton Hart, 1919 16th St., N. W., Washington, D. C....1937
Merritt, Arthur, Jr., Route 3, Robstown, Texas....1937
Meyer, Miss Adelphia, 2009 W. Jackson St., Muncie, Indiana....1931
Michener, Harold, 418 N. Hudson Av., Pasadena, California....1926
Mickey, A. B., Department of Zoology, University of Wyoming, Laramie, Wyoming....1935
Miller, Alden Holmes, Museum of Vertebrate Zoology, Berkeley, California....1930
Miller, Henry C., 29 Sheridan Dr., Monroe, Michigan....1938
Miller, Robert Cunningham, University of Washington, Seattle, Washington....1935
Milnes, Miss Harriet Kernahan, 331 Gowen Av., Philadelphia, Pennsylvania....1935
Mitchell, Harold Dies, 378 Crescent Av., Buffalo, New York....1936
Moffitt, James, 1879 Broadway, San Francisco, California....1931
Mohr, Dr. Carl Otto, Illinois Natural History Survey, Urbana, Illinois....1936
Monk, Harry Crawford, 3108 Long Blvd., Nashville, Tennessee....1920
Monroe, Burt Leavelle, 207 N. Birchwood Av., Louisville, Kentucky....1935
Monson, Gale, 311 East Green, Gallup, New Mexico....1933

Montagua, Guglielmo Trono, Laboratory of Ornithology, Cornell University, Ithaca, New York....1937
Moore, Paul Joseph, 1805 Vinton Av., Portsmouth, Ohio....1936
Moore, Miss Dora, 60 E. Mulberry St., Athens, Ohio....1934
Morrill, Ralph Everett, 1217 Olivia Av., Ann Arbor, Michigan....1936
Morrison, Kenneth Douglas, 3544 Colfax Av., S., Minneapolis, Minnesota....1937
Morse, Marius, CCC S-54, Big Fork, Minnesota....1938
Mosby, Henry S., 413 Thompson St., Ann Arbor ,Michigan....1937
Mounts, Dr. Beryl Taylor, Ballard Normal School, Macon, Georgia....1923
Mousley, William Henry, 4073 Tupper St., Westmount, Montreal, Quebec, Canada....1922
Mueller, Walter Josef, 3043 N. Prospect Av., Milwaukee, Wisconsin....1936
Munro, James Alexander, Okanagan Landing, British Columbia....1935
Munter, Capt. William Henry, U. S. Coast Guard, 806 Wilkens Bldg., Washington, D. C....1933
Murdock, Earle C., Soil Conservation Service, LeRoy, Maryland....1936
Murie, Adolph, 400 Keeline Bldg., Omaha, Nebraska....1932
Murie, Olaus Johan, Jackson, Wyoming....1934
Murphey, Dr. Eugene Edmund, 432 Telfair St., Augusta, Georgia....1935
Murphy, Paul, 57 New England Av., Summit, New Jersey....1936
Murray, Rev. Joseph James, Lexington Presbyterian Church, Lexington, Va....1931
Myers, Mrs. Harriet Williams, 311 N. Avenue 66, Los Angeles, California....1936
Myrus, Adolphe A., 81 Ford Av., Oneonta, New York....1934
Nelson, Arnold Lars, U. S. Biological Survey, Washington, D. C....1932
Nelson, Charles Ellsworth, Jr., 146 Frame Av., Waukesha, Wisconsin....1937
Nelson, L. R., Winchester, New Hampshire....1936
Nesbit, Ray J., Collins, Ohio....1936
Nessle, James P., 1823 Barrows St., Toledo, Ohio....1936
Nichols, L[eon] Nelson, 315 East 68th St., New York, New York....1937
Nicholson, Donald John, 534 S. Eola Dr, Orlando, Florida....1934
Norton, Arthur Herbert, Portland Society of Natural History, 22 Elm St., Portland, Maine....1934
Odum, Eugene Pleasants, Experimental Zoology Laboratory, Wright and Healey Sts., Champaign, Illinois....1930
Oliver, Miss Mary Clara, Silver City, New Mexico....1934
O'Reilly, Ralph Anthony, Jr., 2256 Briarwood Rd., Cleveland Heights, Ohio....1936
Orr, Ellison, Waukon, Iowa....1936
Osborn, Ben Orville, 122 East Republic, Salina, Kansas....1937
Overing, Robert, Landover, Maryland....1930
Owre, Oscar, Jr., 2625 Newton Av. S., Minneapolis, Minnesota....1935
Packard, Stanley E., Troy, Pennsylvania....1936
Paff, Dr. William Alfred, Lincoln Hospital, New York City, New York....1937
Palmer, Ralph Simon, Route 1, Growstown Rd., Brunswick, Maine....1934
Parker, Mrs. Kenneth, 1000 Milwaukee Av., Janesville, Wisconsin....1937
Payne, Russell B., 211 Broadway, Niles, Michigan....1938
Pearsall, Gordon, 143 S. Harvey Av., Oak Park, Illinois....1936
Peasley, Mrs. Harold Raymond, 2001 Nash Dr., Des Moines, Iowa....1934
Peavey, Mrs. Leonore Gastineau, 4222 Carrollton St., Indianapolis, Indiana....1937
Peet, Dr. Max Minor, 2030 Hill St., Ann Arbor, Michigan....1935
Pegg, Harry C., Glenevis, Alberta, Canada....1936
Pennell, Miss Edna, 503 N. Main St., Mount Vernon, Ohio....1931
Perry, Harold E., 1841 Colina Drive, Glendale, California....1932
Perry, Thomas, Jr., Vanderbilt Hall 446, Boston, Massachusetts....1937
Peters, Dr. Harold Seymour, U. S. Biological Survey, Auburn, Alabama....1936
Peterson, Alfred, Box 211, Pipestone, Minnesota....1931
Peterson, Mrs. Charles Emil, Madison, Minnesota....1936

Peterson, Mervin H., Payson, Utah....1936
Peterson, Nels Theodore, 80 Oaklawn Av., Battle Creek, Michigan....1931
Pickens, Dr. Andrew Lee, Paducah Junior College Library, Paducah, Ky....1927
Pierce, John T., Anita, Iowa....1930
Pitelka, Frank Alois, 7337 Ogden Av., Lyons, Illinois....1938
Poland, Lloyd, 526 W. Burke St., Martinsburg, West Virginia....1934
Pond, John, 1776 N. Parkway, Memphis, Tennessee....1937
Poor, Hustace Hubbard, 112 Park Av., Yonkers, New York....1935
Potter, Julian Kent, 437 Park Av., Collingswood, New Jersey....1915
Pratt, Delbert Randall, McKinley High School, Canton, Ohio....1932
Price, Mrs. Elizabeth H., Room 202, 465 Post St., San Francisco, California....1937
Price, Dr. John Basye, 532 Alvarado St., Stanford University, California....1931
Raasch, Gilbert O., % Darby Petroleum Co., Wichita, Kansas....1936
Ragusin, Anthony Vincent, P. O. Box 496, Biloxi ,Mississippi....1937
Rahe, Carl W., 4666 Turney Rd., Cleveland, Ohio....1931
Ramsden, Dr. Charles Theodore, 8 & 19, Vista Alegre, Santiago de Cuba, Cuba....1914
Rapp, Frederick William, Vicksburg, Michigan....1926
Rea, Gene, 2378 Neil Av., Columbus, Ohio....1936
Reed, Mrs. Carlos Isaac, 448 S. Villa Av., Villa Park, Illinois....1937
Replogle, Col. Wayne, Elgin Academy, Elgin, Illinois....1938
Reuss, Alfred Henry, Jr., 12910 S. Mozart St., Blue Island, Illinois....1936
Rice, Mrs. Bird Wells, 103 S. Miller St., Cynthiana, Kentucky....1935
Rich, Dr. Guy C., 1820 El Cerrito Pl., Hollywood, California....1914
Richter, Carl H., 703 Main St., Oconto, Wisconsin....1936
Ricks, Jessie J., 30 E. 42nd St. ,New York, New York....1931
Rogers, Irl, 402 Alturas Av., Modesto, California....1937
Rosewall, Dr. Oscar Waldemar, Department of Zoology, Louisiana State University. Baton Rouge, Louisiana....1931
Rosier, Eugene, Petit Saconnex, Geneva, Switzerland....1937
Ross, C[harles] Chandler, 7924 Lincoln Dr., Chestnut Hill, Pennsylvania....1937
Ross, Hollis Trevor, 109 S. 3rd St., Lewisburg, Pennsylvania....1933
Ross, Miss Julie E., Cosmos, Minnesota....1920
Royer, Milton Larimore, Columbia Station, Ohio....1937
Russell, Henry Norris, Jr., 79 Alexander St., Princeton, New Jersey....1932
Russell, Dr. Whitfield Leggett, Box 22, Rhome, Texas....1935
Rysgaard, George Nielson, 1400 Capitol Av., St. Paul, Minnesota....1937
Sargent, Dr. William Dunlap, Biology Department, College of the City of New York, Lexington Av. and 23rd St., New York, New York....1931
Sattire, A. M., Concordia College, Moorhead, Minnesota....1934
Saunders, Aretas Andrews, 48 Longview Av., Fairfield, Connecticut....1934
Savage, David L., Mount Pleasant, Iowa....1938
Savage, Ralph Butler, Jr., 936 Bellefonte St., Pittsburgh, Pennsylvania....1937
Sawyer, Miss Dorothy, Box 433, Sidney, New York....1937
Schaller, R. A., 124 S. College Drive, Bowling Green, Ohio....1930
Scheffer, Paul Martin, U. S. Soil Conservation Service, Spokane, Washington....1937
Schlenker, Miss Lydia, Mercereau Apts., 208 19th St., Toledo, Ohio....1937
Schmidt, Miss Claudia, 39 Ely Av., West Springfield, Massachusetts....1937
Schneider, Miss Evelyn, 227 Alta Av., Louisville, Kentucky....1935
Schroeder, Miss Clara, 998 West High St., Lima, Ohio....1937
Schultz, Miss Helen, Box 105, State Teachers College, Fredericksburg, Va....1929
Schwandt, Miss Irma M., Milwaukee Country Day School, Santa Monica Blvd., Milwaukee, Wisconsin....1936
Schwartz, Mrs. Raymond, 2423 W. Cochran St., Blue Island, Illinois....1937
Scotland, Dr. Minnie Brink, 42 Continental Av., Cohoes, New York....1938
Scott, David Maxwell, 218 Hillsdale Av., E., Toronto, Ontario, Canada....1937

Scott, Dr. Thomas George, Department of Zoology, Science Bldg., Ames, Iowa..1936
Seaman, Elwood Armstrong, 1368 Beall Av., Wooster, Ohio.....1937
Semple, John Bonner, Linden Place, Sewickley, Pennsylvania.....1938
Serbousek, Miss Lillian, 1226 2nd St., S. W., Cedar Rapids, Iowa.....1935
Shadle, Albert Ray, Department of Biology, University of Buffalo, Buffalo, New York.....1930
Shaftesbury, Dr. Archie D[avis], N. C. C. W., Greensboro, North Carolina.....1930
Shager, Grant H., 1121 S. Eye St., Tacoma, Washington.....1937
Sharp, Dr. Ward M., Valentine Lakes Waterfowl Refuge, Valentine, Nebraska..1936
Shaver, Dr. Jesse Milton, Peabody Teachers College, Nashville, Tennessee.....1922
Sheppard, Roy Watson, 1805 Mouland Av., Niagara Falls, Ontario, Canada....1933
Sherwood, John Willits, Box 1070, Salinas, California.....1936
Shipman, Charles W., 114 Ridge Rd., Willoughby, Ohio.....1930
Shoemaker, Hurst Hugh, Dept. Zoology, University of Chicago, Chicago, Ill.....1937
Simpson, Thomas William, Jr., 81 Stonewall Pl., Memphis, Tennessee.....1937
Skaggs, Merit Bryan, Julian Rd., South Euclid, Ohio.....1934
Slack, Miss Mabel, 1004 Everett Av., Louisville, Kentucky.....1934
Smith, Dr. Arthur Francis, Manning, Iowa.....1934
Smith, Charles Galloway, Box 429, Tupelo, Mississippi.....1938
Smith, Lewis MacCuen, 26 Benezet St., Chestnut Hill, Philadelphia, Pa.....1931
Smith, Orion O., Dept. 11, Barber Colman Co., Rockford, Illinois.....1936
Smith, Robert Henry, White River Refuge, St. Charles, Arkansas.....1937
Smith, Wendell Phillips, Wells River, Vermont.....1921
Smyth, J[ames] Adger, Puno, Peru, South America.....1933
Snook, Mrs. Bertha Stewart, 311 Drury Lane, Troy, Ohio.....1937
Snyder, Lester Lynne, Royal Ontario Museum of Zoology, Bloor St. and Avenue Rd., Toronto 5, Ontario, Canada.....1929
Soper, J[oseph] Dewey, 827 Riverwood Av., Fort Garry, Winnipeg, Manitoba, Canada.....1937
Spawn, Gerald B., Squaw Creek Refuge, Mound City, Missouri.....1934
Speck, Mrs. E. C., Whitehall, Montana.....1937
Speirs, John Murray, 17 Wolfrey Av., Toronto 6, Ontario, Canada.....1931
Sprot, George Doveton, Cobble Hill, Vancouver Island, British Columbia, Canada.....1937
Staebler, Arthur Eugene, 2021 Pontiac, Box 252, Ann Arbor, Michigan.....1937
Starrett, William Charles, 303 Maryland Av., Peoria, Illinois.....1933
Stephansky, J. D., % Department of Conservation, Newberry, Michigan.....1935
Stevens, O. A., State College Station, Fargo, North Dakota.....1926
Stevenson, James Osborne, Wildlife Division, National Park Service, Washington, D. C.....1931
Stewart, Paul Alva, Leetonia, Ohio.....1925
Steyermark, Mrs. G. A., 6155 Eberhardt St., Chicago, Illinois.....1935
Stiles, Bruce F., 2111 S. Newton Av., Sioux City, Iowa.....1935
Stine, Miss Perna M., State Teachers College, Minot, North Dakota.....1931
Stone, Dr. Witmer, Academy of Natural Sciences, Logan Square, Philadelphia, Pennsylvania.....1937
Stophlet, John J., 2612 Maplewood Av., Toledo, Ohio.....1934
Storer, Robert Winthrop, 522 Vose Av., South Orange, New Jersey.....1938
Storer, Dr. Tracy Irwin, Division of Zoology, University Farm, Davis, Calif.....1928
Strickland, Mrs. Laura Raymond, 578 E. Central St., Franklin, Massachusetts..1935
Stupka, Arthur, Smoky Mountains National Park, Gatlinburg, Tennessee.....1935
Stupp, Jack Phelps, 510 S. Price Rd., Clayton, Missouri.....1934
Sturgeon, Myron, 259 W. 2nd St., Salem, Ohio.....1934
Sturgis, Irwin, Rural, % Mrs. Ethel Van Meter, Higginsville, Missouri.....1935
Sumner, Eustace Lowell, Box 188, Menlo Park, California.....1931
Sumner, Eustace Lowell, Jr., Box 188, Menlo Park, California.....1929
Swedenborg, Ernie David, 4905 Vincent Av., S., Minneapolis, Minnesota.....1929
Taber, Wendell, 3 Mercer Circle, Cambridge, Massachusetts.....1936
Taft, Miss Elizabeth A., 1132 N. Alabama St., Indianapolis, Indiana.....1937
Tait, Miss Blanche, 107 S. Clarke St., Milledgeville, Georgia.....1936
Tanner, James Taylor, 67 Greenbush St., Cortland, New York.....1937

Tanner, Orey, 5019 Constance St., New Orleans, Louisiana....1933
Tate, R[alph] Crompton, Kenton, Cimarron Co., Oklahoma....1938
Taverner, Percy Algernon, National Museum of Canada, Ottawa, Ontario, Canada....1925
Teachenor, Dix, 1020 W. 61st St., Kansas City, Missouri....1923
Terrill, Lewis McIver, 216 Redfern Av., Westmount, Montreal, Canada....1936
Test, Dr. Frederick H., 511 Russell St., West Lafayette, Indiana....1931
Thabes, Mrs. Daisy Adelaide, 417 Holly St., Brainerd, Minnesota....1938
Thomas, Judge Otho S., 205 S. Greene St., Rock Rapids, Iowa....1932
Thomas, Mrs. Rowland, R. F. D. 4, North Little Rock, Arkansas....1937
Thorp, George Boulton, Carnegie Institute of Technology, Pittsburgh, Pa....1935
Tobin, Miss Katherine E., Plaza Hotel, Monroe and Robinwood Av., Toledo, Ohio....1937
Todd, Henry O., Jr., Woodbury Rd., Murfreesboro, Tennessee....1938
Tonkin, George, 207 Federal Office Building, Des Moines, Iowa....1938
Tomkins, Ivan Rexford, U. S. Dredge Morgan, Savannah, Georgia....1931
Tracy, Ernest B., Holland Rd., Far Hills, New Jersey....1937
Trautman, Milton Bernhard, Museum of Zoology, Ann Arbor, Michigan....1932
Travis, Bernard V., Box 508, Valdosta, Georgia....1935
Trimble, Miss Ruth, Carnegie Museum, Pittsburgh, Pennsylvania....1935
Trouslot, Rollin Burdette, Box 373, Walnut Creek, California....1937
Tubbs, Farley F., Department of Conservation, Game Division, Lansing, Michigan....1935
Turnbull, James Douglas, 2065 W. 48th Av., Vancouver, British Columbia....1936
Tuttle, Henry Carlisle, 230 Boylston St., Boston, Massachusetts....1930
Twomey, Arthur Cornelius, 113 S. Lincoln St., Urbana, Illinois....1936
Uhler, Francis Morey, U. S. Biological Survey, Washington, D. C....1931
Ussher, Richard Davy, Nancy Lake Farm, King, Ontario, Canada....1934
Vaiden, Meredith Gordon, Rosedale, Mississippi....1937
Valencourt, William, Carleton College, Northfield, Minnesota....1937
Van Epps, Claude A., Onaka, South Dakota....1936
Van Deusen, Horbart M., 128 Pinehurst Av., New York, New York....1934
Vasicek, John Matthew, 10605 Lamontier Av., Cleveland, Ohio....1934
Vetter, Dr. Charles, Grand View, Nyack, New York....1931
Vogt, William, 609 W. 114th St., New York, New York....1935
Wade, Douglas E., 1532 University Av., Madison, Wisconsin....1936
Wadsworth, Frank Howard, 5917 E. Circle Av., Chicago, Illinois....1938
Wagner, Miss Esther Elizabeth, 11 8th Av., Danbury, Cennecticut....1937
Walker, Alexander, Tillamook, Oregon....1938
Walker, Robert Lee, 38 Weld Hall, Harvard University, Cambridge, Mass....1936
Walker, W. M., Jr., Apt. 10, 1825 W. Clinch Av., Knoxville, Tennessee....1925
Wallace, George John, Pleasant Valley Sanctuary, Lenox, Massachusetts....1937
Wallace, Robert Browne, 3213 Oakland St., Ames, Iowa....1935
Watson, Frank Graham, 101 Lockhart Hall, Princeton, New Jersey....1937
Watson, Lucius Howard, 4103 Sheridan Blvd., Lincoln, Nebraska....1922
Watters, Robinson C., Box 298, Cambridge, Maryland....1935
Watterson, William H., 3671 Daleford Rd., Cleveland, Ohio....1929
Weadock, Vincent, 302 Bearinger Bldg., Saginaw, Michigan....1938
Weaver, Richard Lee, Fernow Hall, Cornell University, Ithaca, New York....1936
Wells, Mrs. Rollo H., 3819 Zenith Ave., S., Minneapolis, Minnesota....1938
Welter, Dr. Wilfred August, Teachers College, Morehead, Kentucky....1931
Wetherbee, Mrs. Kenneth Brackett, 11 Dallas St., Worcester, Massachusetts....1930
Weyl, Edward Stern, 6506 Lincoln Dr., Mt. Airy, Philadelphia, Pennsylvania....1927
Whittemore, Wendell, 1276 Linden Av., Memphis, Tennessee....1937
Widmann, Berthold, 4621 Wesley Av., Los Angeles, California....1936
Wight, Howard Marshall, School of Forestry and Conservation, University of Michigan, Ann Arbor, Michigan....1935
Wiles, Dr. Harold O[liver], 6054 Ingleside Av., Chicago, Illinois....1936
Wilkinson, Alexander Stanley, Kapiti Island, Wellington, New Zealand....1930
Williams, Cecil S., Bear River Refuge, Brigham, Utah....1936
Williams, John Raynesford, 801 W. Nevada St., Urbana, Illinois....1936

Williams, Laidlow Onderdonk, Box 453, Carmel, California....1930
Williams, Noel J., Milford, Iowa....1918
Williams, Robert White, U. S. Biological Survey, Washington, D. C....1926
Williamson, Lyman O., State Fish Hatchery, Hayward, Wisconsin....1937
Willis, Warren J., 24824 89th Av., Belle Rose, Long Island, New York....1928
Willman, Harold Bowen, 206 S. McCullough St., Urbana, Illinois....1938
Wilson, Burtis H., 7655 Sheridan Rd., 3rd Apt., Chicago, Illinois....1936
Wimsatt, William Abell, 11 Grafton St., Chevy Chase, Maryland....1937
Witschi, Dr. Emil, Department of Zoology, State University of Iowa, Iowa City, Iowa....1935
Witmer, Prof. S. W., Dept. Biology, Goshen College, Goshen, Indiana....1935
Wollerman, Edward Henry, 4513 Laflin Av., Cleveland, Ohio....1938
Wood, Dr. Harold Bacon, 3016 N. Second St., Harrisburg, Pennsylvania....1932
Wood, Norman Asa, Museum of Zoology, University of Michigan, Ann Arbor, Michigan....1925
Woodring, George Blackburn, Hillsboro Branch, American National Bank, Nashville, Tennessee....1937
Woodward, Arthur Jason, 504 Kahkwa Blvd., Erie, Pennsylvania....1937
Woolman, Edward, Box 128, Haverford, Pennsylvania....1928
Work, Mrs. Robert, Bosky Acres, Barrington, Illinois....1934
Worley, John G., 237 Charleston St., Cadiz, Ohio....1936
Young, James Boswell, 2516 Talbott Av., Louisville, Kentucky....1937
Youngworth, William, 3119 E. 2nd St., Sioux City, Iowa....1934
Zimmerman, Fred Robert, 523 West Wilson St., Madison, Wisconsin....1935
Zinser, Miss Alfrieda, Methodist Hospital, Sioux City, Iowa....1936